

NATIONAL GEOGRAPHIC

Jamestown The Real Story

How settlers destroyed
a native empire and
changed the landscape
from the ground up

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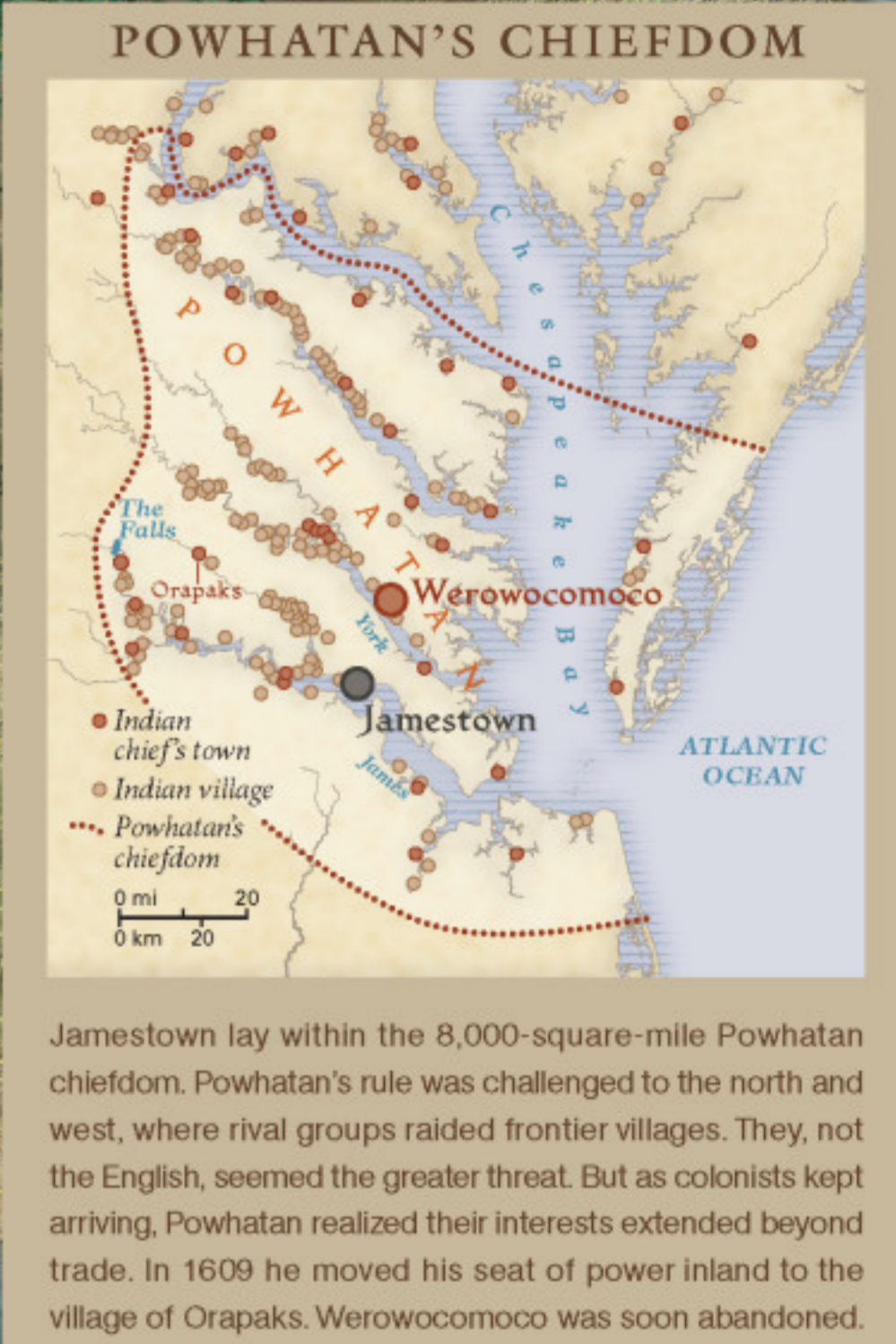
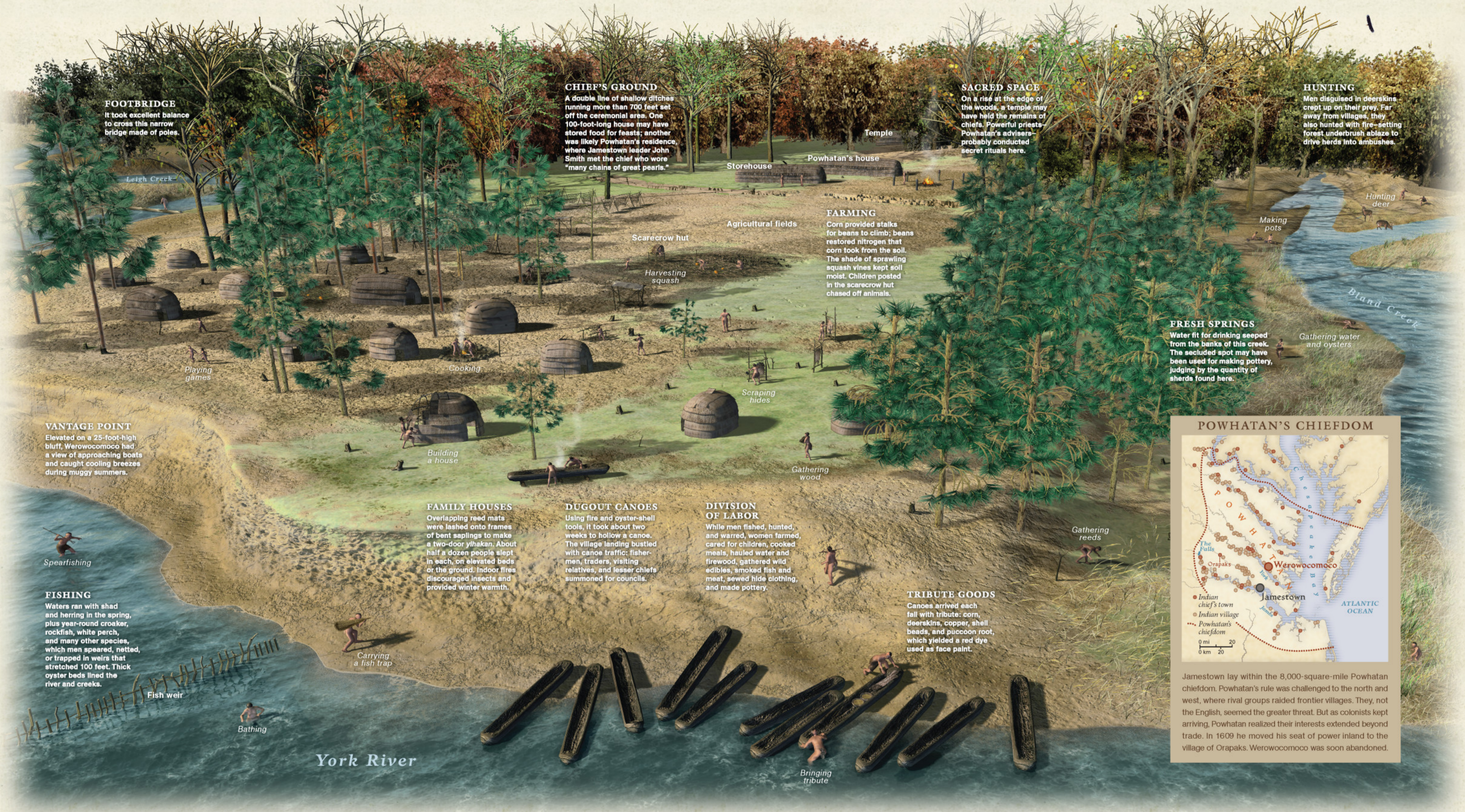


1607

WHEN CULTURES COLLIDED

Two ways of life met 400 years ago in Virginia. The Powhatan Indians were prospering on fertile riverfront lands rich in fish and game. Their villages were small, but, joined together, their warriors formed a powerful army. The 104 English colonists, staked by investors, came searching for profit. From their outpost at Jamestown they hoped to claim an empire.

ART: ADRIAN NUI. RESEARCH: PATRICIA HEALY. DESIGN AND ART DIRECTION: OLIVER UBERTI. TEXT: KAREN E. LANGE. AUTHOR: JANE VESSELLS. EDITOR: TARYN SALINAS. RESEARCHER CONSULTANTS: WEROWOCOMOCCO MARTIN GALLAGHER, COLLEGE OF WILLIAM AND MARY; BOB AND LYNN RIPLEY, HELEN C. ROUNTREE, POWHATAN, POWHATAN, OF CHANGING COURSE; THREE INDIAN LIVES CHANGED BY JAMESTOWN; F. RANDOLPH TURNER III, VIRGINIA DEPARTMENT OF HISTORIC RESOURCES; JAMESTOWN WILLIAM W. REED; JAMES VAN BEVERLY STRAIBER, APVA PRESERVATION VIRGINIA; LIVING HISTORY ASSOCIATES, LTD., LHAUTO.COM. EXPLORE WEROWOCOMOCCO AND JAMESTOWN IN OUR 3-D INTERACTIVE FEATURE, NARRATED BY EXPERTS: NGM.COM/JAMESTOWN. COPYRIGHT © 2007 NATIONAL GEOGRAPHIC SOCIETY, WASHINGTON, D.C. PRINTED MARCH 2007.



Jamestown lay within the 8,000-square-mile Powhatan chiefdom. Powhatan's rule was challenged to the north and west, where rival groups raided frontier villages. They, not the English, seemed the greater threat. But as colonists kept arriving, Powhatan realized their interests extended beyond trade. In 1609 he moved his seat of power inland to the village of Orapaks. Werowocomoco was soon abandoned.

Werowocomoco was known only from historical accounts until archaeologists from the Virginia Department of Historic Resources and the College of William and Mary announced its discovery in 2003. Virginia's Indian tribes are consultants. This painting is the first re-creation of the site, today part of a private farm.

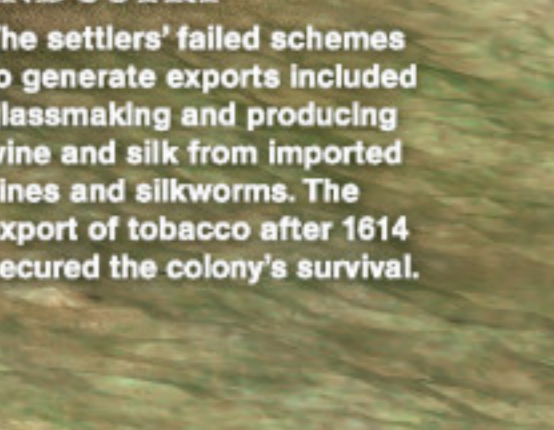
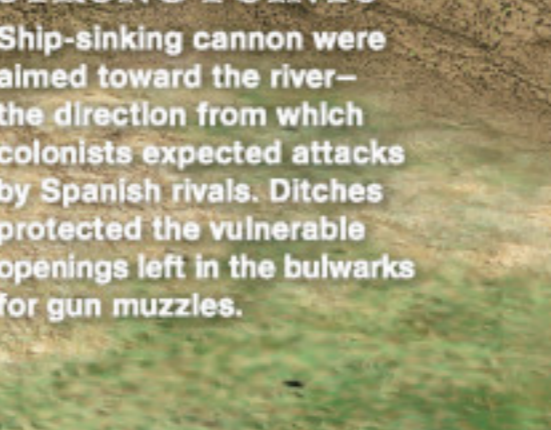
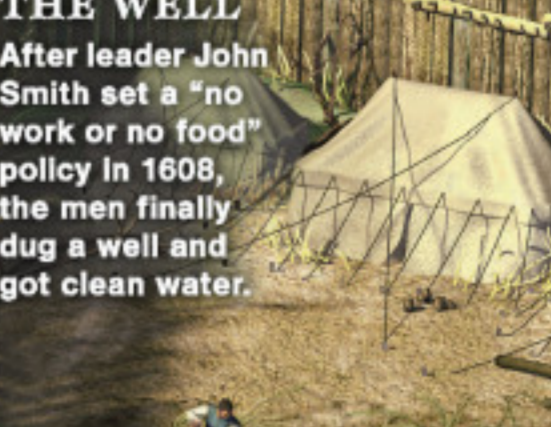
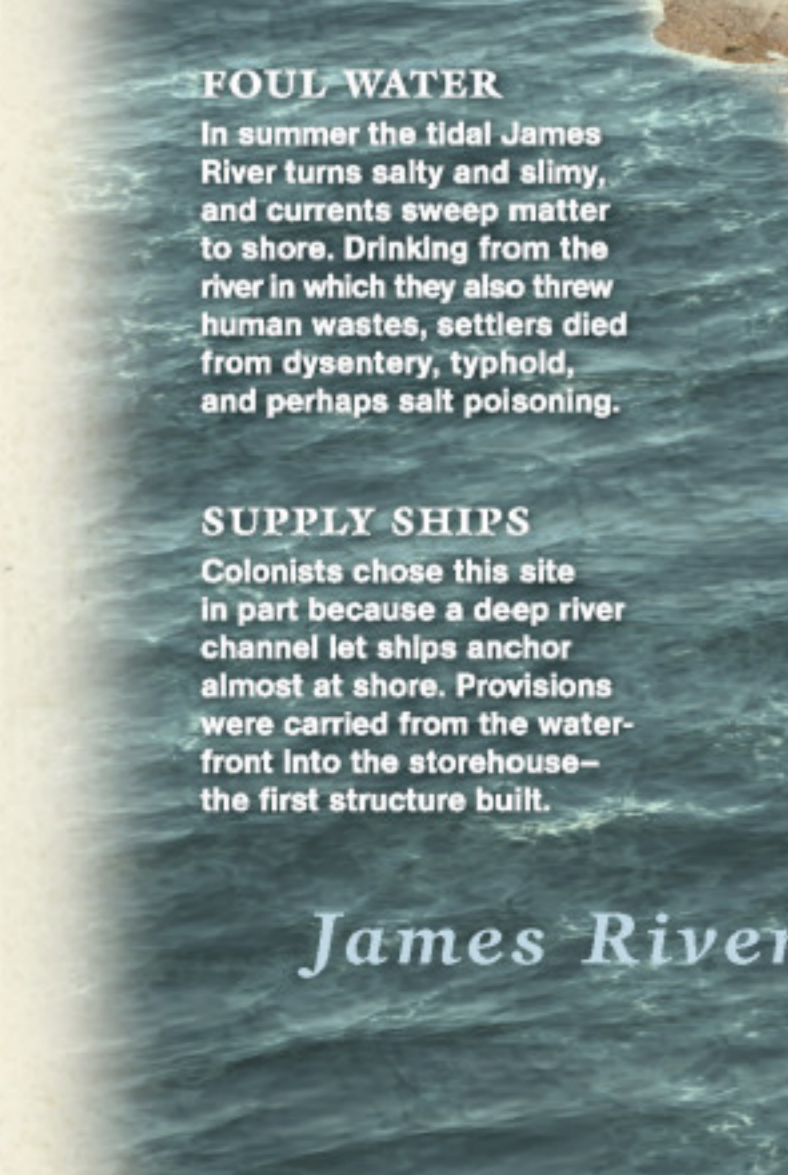
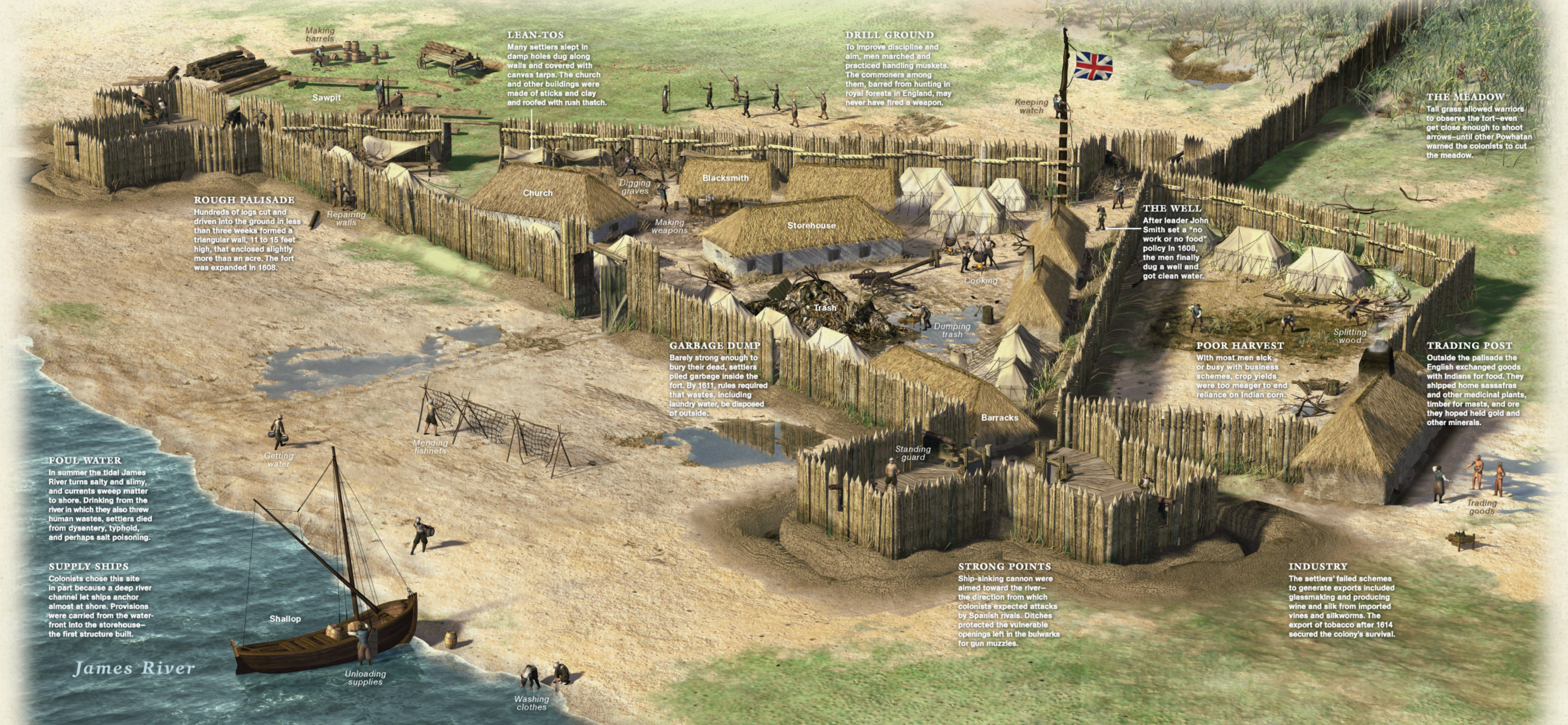
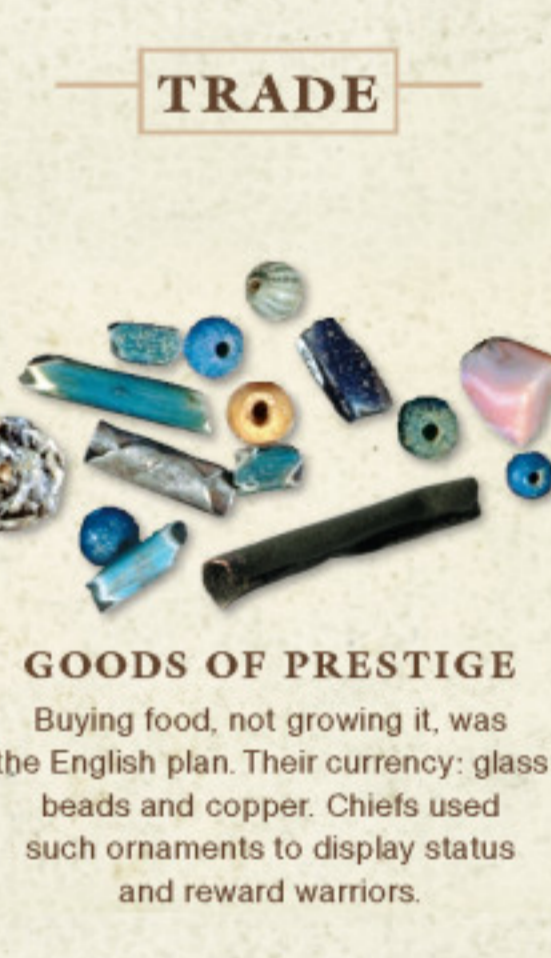
Werowocomoco

Naturally defended by bluff and creeks, this commanding site was the capital of the Powhatan Indian chiefdom. Called Werowocomoco—"the chief's place"—it was chosen by the paramount chief as his residence because of its long history as a sacred place. The English called this man Powhatan (his actual name was Wahunsenacawh). From this 45-acre village of about 100 people he commanded the allegiance of more than 14,000 Indians. His chiefdom was a new political entity, growing rapidly as he persuaded or forced new groups to join. When the English arrived, he was at the apex of his power.

Jamestown

That Jamestown would survive to become the New World's first permanent English settlement seemed unlikely in its first years. Strategically sited to ward off Spanish attacks that never came, the colony was built on a marshy peninsula lacking fresh water. Relations with the Powhatan Indians were alternately cordial and hostile. Often trapped in their hastily built palisade, the colonists suffered hunger and disease; within five months, nearly half were dead. A well-coordinated attack might have ended it all. But Powhatan believed the English, with their metal tools and firearms, would make useful trading partners and allies.

The site of the Jamestown fort was thought lost to river erosion until a team led by archaeologist William Kelso of APVA Preservation Virginia found evidence of the structure in 1994. The fort is shown as it would have looked in the fall of 1607.



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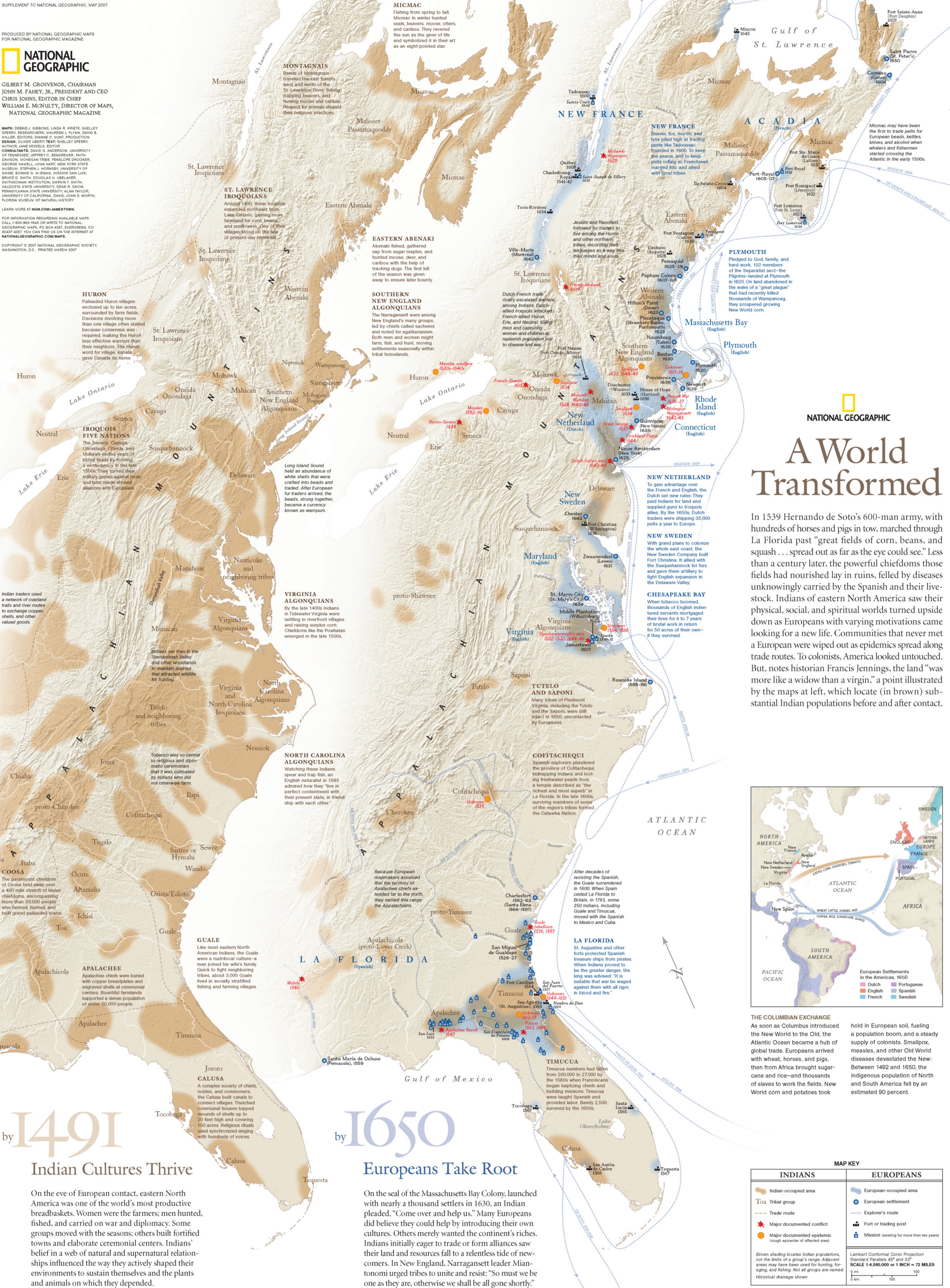
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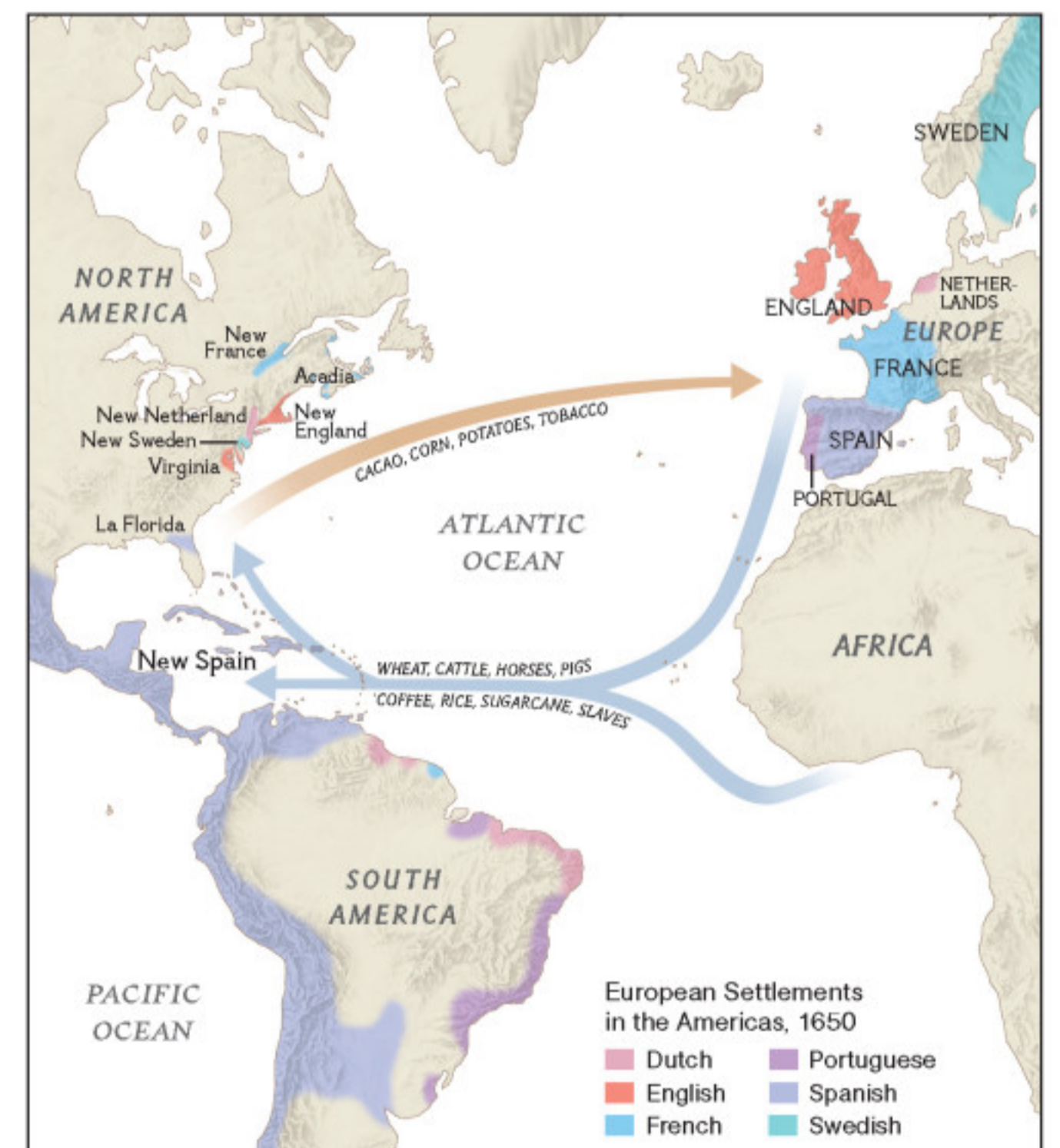
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A World Transformed

In 1539 Hernando de Soto's 600-man army, with hundreds of horses and pigs in tow, marched through La Florida past "great fields of corn, beans, and squash... spread out as far as the eye could see." Less than a century later, the powerful chiefdoms those fields had nourished lay in ruins, felled by diseases unknowingly carried by the Spanish and their livestock. Indians of eastern North America saw their physical, social, and spiritual worlds turned upside down as Europeans with varying motivations came looking for a new life. Communities that never met a European were wiped out as epidemics spread along trade routes. To colonists, America looked untouched. But, notes historian Francis Jennings, the land "was more like a widow than a virgin," a point illustrated by the maps at left, which locate (in brown) substantial Indian populations before and after contact.



MAP KEY

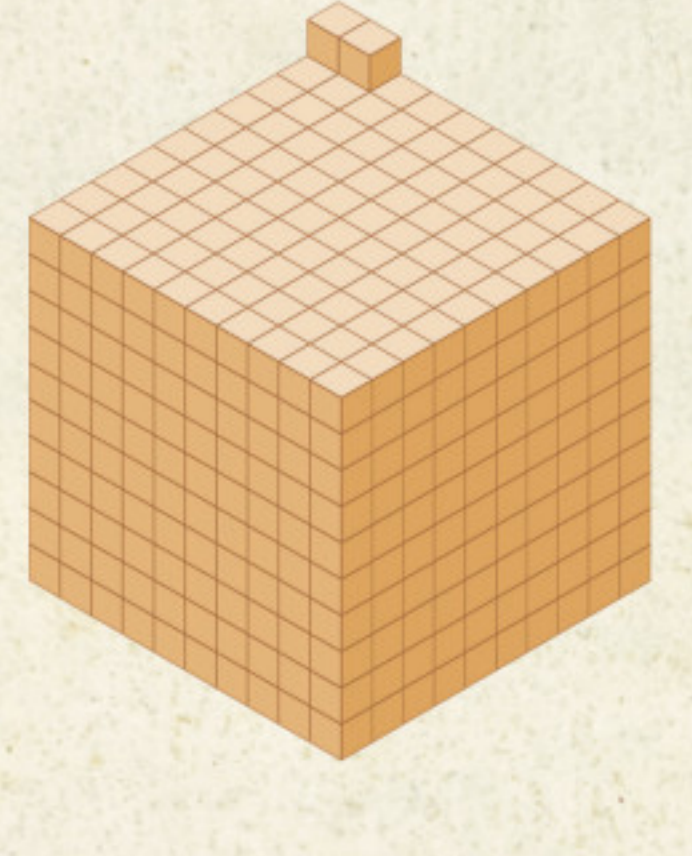
INDIANS	EUROPEANS
Indian-occupied area	European-occupied area
Tribal group	Explorer's route
Trade route	Major documented conflict
Major documented epidemic (rough epicenter of affected area)	Fort or trading post
	MISSION (existing for more than ten years)

Brown shading locates Indian populations, not the limits of a group's range. Adjacent areas may have been used for hunting, foraging, and fishing. Not all groups are named. Historical drainage shown.

Lambert Conformal Conic Projection
Standard Parallels 45° and 33°
SCALE 1:4,500,000 or 1 INCH = 72 MILES
0 m 100 100
0 km 100 100

Population

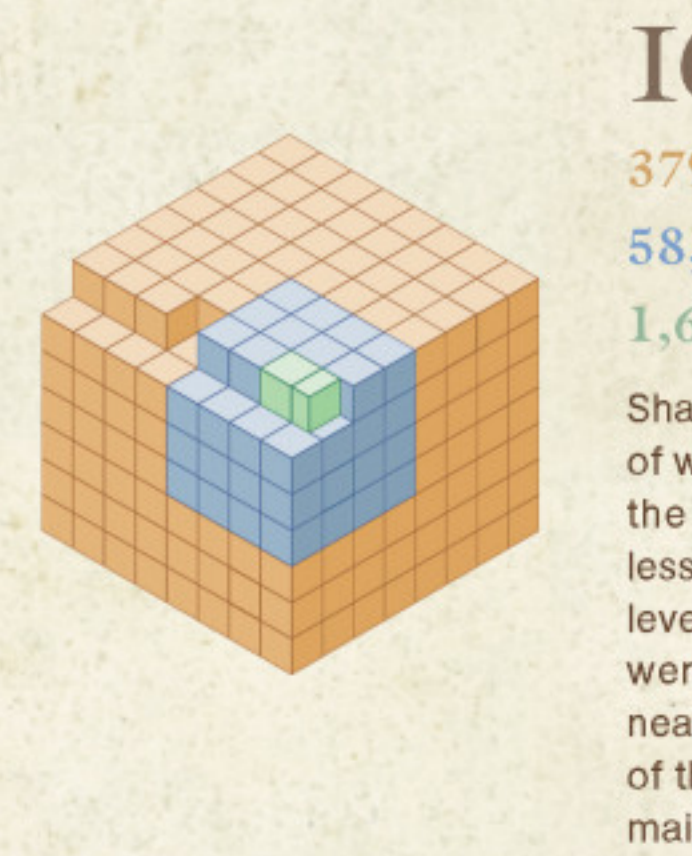
1500 to 1800
Estimates of North America's Indian population before contact are hotly debated. Counts rely on the observations of Europeans at different times and places and on limited archaeological evidence. These graphs (right) are based on the tribe-by-tribe analysis of Smithsonian anthropologist Douglas Ubelaker and encompass a slightly larger area of the East than is shown on the maps above. For all of North America, from northern Mexico into the Arctic, Ubelaker's study counts 2.4 million Indians at contact, almost half of them in the East.



1650

379,000 INDIANS
58,000 EUROPEANS
1,600 AFRICANS

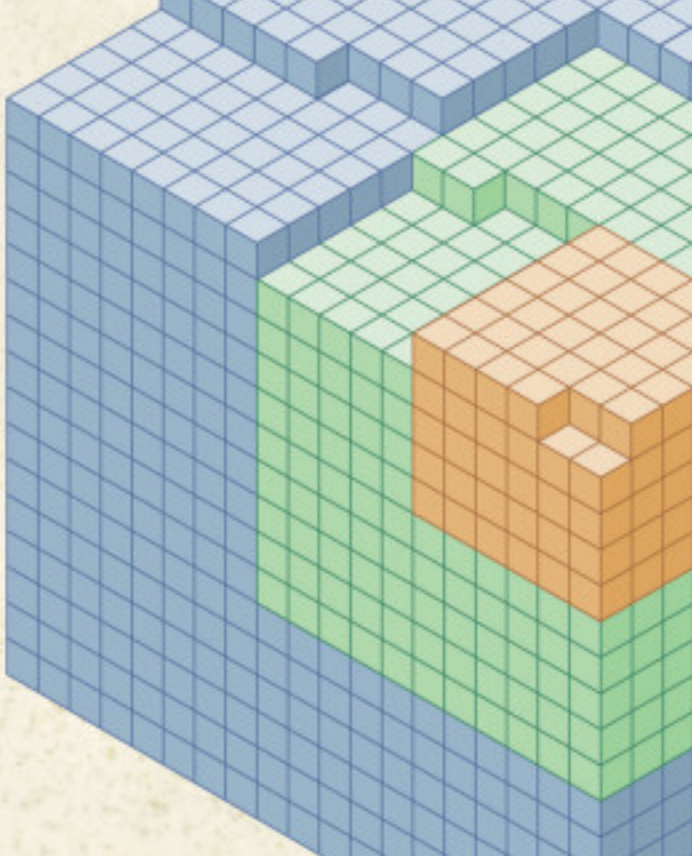
Shattered by epidemics, only a fraction of which appear in the historical record, the Indian population by 1650 was less than 40 percent of its precontact level. Most of the European colonists were clustered in New England or near Chesapeake Bay. More than half of the African slaves lived in the north, mainly in New Netherland.



1800

178,000 INDIANS
4,763,000 EUROPEANS
1,002,000 AFRICANS

Europeans dominated eastern North America by 1800. Of a million-plus Africans, almost 900,000 were slaves. Not until 1860 did the U.S. census officially count Indians, but only those who had "renounced tribal rule." That figure, for the nation, was 40,000. Rebounding in the 20th century, the U.S. Indian population is now 2.8 million.

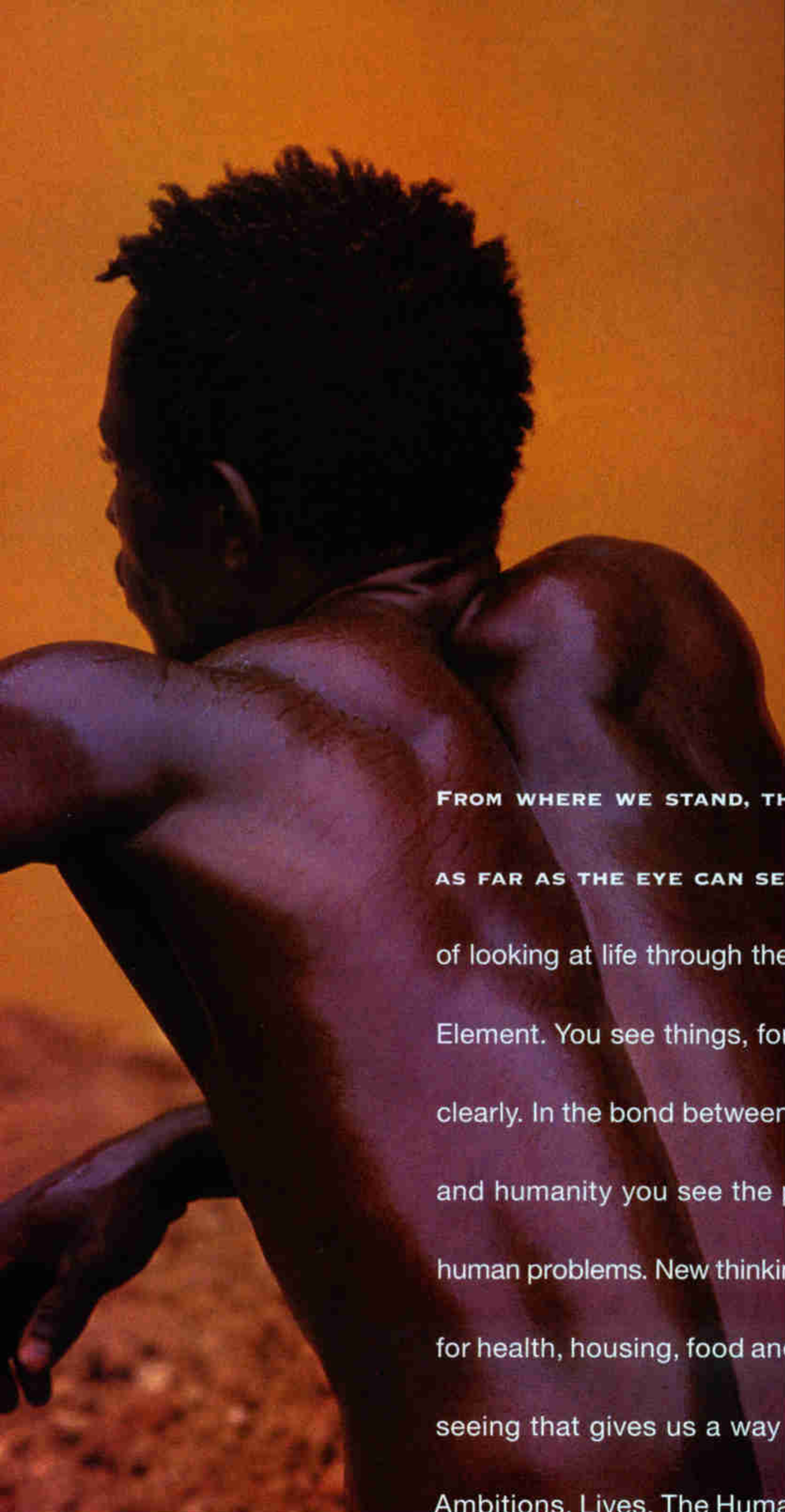


52

Hu

HUMAN

7E+09



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Orinoco Crocodile (*Crocodylus intermedius*)

Size: Head to tail length averages 125 - 197 inches **Weight:** 440 - 838 lbs

Habitat: Freshwater riverine habitats in the middle and lower reaches of the Orinoco River basin and the savannas of the Llanos **Surviving number:** Estimated at 250 - 1,500 non-hatchlings



Photographed by Robert Caputo

WILDLIFE AS CANON SEES IT

Warm and cuddly they aren't. With fearsome teeth and hardy hides, Orinoco crocodiles are the very definition of tough. South America's largest predator is certainly intimidating, but there is much more to it than brawn: it lives within a complex social structure governed by dominance hierarchies, and has a repertoire of vocalizations at its command. Highly protective of their own, mothers will play bodyguard to their young for as long as

three years. But the Orinoco crocodile needs more than teeth to protect it now. Rampant poaching and relentless habitat loss are finally pushing it to the brink of extinction.

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NATIONAL GEOGRAPHIC

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Floodlit expanses of corrugated metal separate Naco, Arizona, on the U.S. side (foreground), from Mexico's Naco, Sonora. See story on page 116.



DIANE COOK AND LEN JENSHEL

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TEXT AND PHOTOGRAPHS BY MARK W. MOFFETT

COVER Watercolor of an Algonquian Indian by early English colonist and artist John White. **TRUSTEES OF THE BRITISH MUSEUM**

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Day 1

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Dino Tracks Under Fire



Hot, Hot, Hot



Bedbugs Are Back

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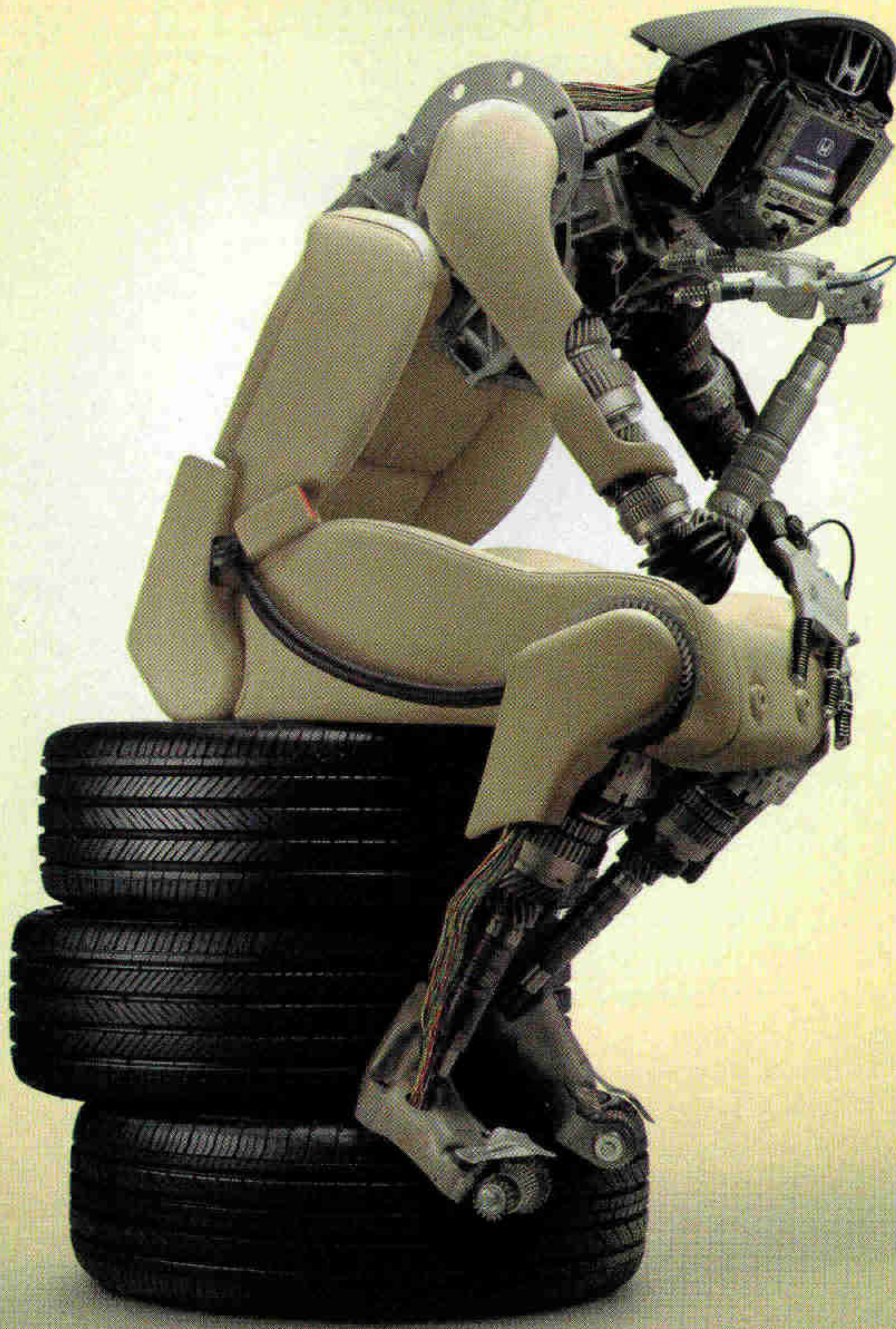
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The Rogue River Indians traded with other groups just over the Cascade mountains for obsidian to make arrowheads. This museum specimen was found near Oregon's Table Rocks.

In October 1855 a mob from Jacksonville, Oregon, killed 26 Rogue River Indians camped near the Table Rock Reservation, a few miles from where I grew up. My father, a history teacher, used to tell me stories about the tragic fate of the Rogue River Indians as we searched for arrowheads made of agate, jasper, and obsidian on the wheat-field-covered hill next to our house.

When I was 12, bulldozers leveled the hill for a more lucrative crop: grass seed. The excavation uncovered a lode of Indian artifacts and burial sites. Delmar Smith, owner of the Crater Rock Museum and our neighborhood resident archaeologist, pleaded with the equipment operator to stop so that we could examine the ruins, but the man flatly refused. "I've got work to do," was all he said. Still, I found several arrowheads and stone tools, which I kept on a shelf above my desk.

As I struggled with my homework, I'd look at my collection and try to imagine what life was like for the Indians before the first settlers arrived in 1851. What did the landscape look like? What did they look like? How did they live? Did their kids have homework? (I suspected not and was envious.)

I donated my collection to a local museum one summer when I was home from college. "America, Found & Lost" addresses some of the questions these artifacts sparked in me as a kid. I think you'll find the picture it paints of the New World before and after European settlement as thought provoking as it is enlightening.

PHOTO: MARK THIESSEN, NATIONAL GEOGRAPHIC PHOTOGRAPHER
ARROWHEAD: CRATER ROCK MUSEUM, CENTRAL POINT, OREGON

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Please read this summary of information about LUNESTA before you talk to your doctor or start using LUNESTA. It is not meant to take the place of your doctor's instructions. If you have any questions about LUNESTA tablets, be sure to ask your doctor or pharmacist.

LUNESTA is used to treat different types of sleep problems, such as difficulty in falling asleep, difficulty in maintaining sleep during the night, and waking up too early in the morning. Most people with insomnia have more than one of these problems. You should take LUNESTA immediately before going to bed because of the risk of falling.

LUNESTA belongs to a group of medicines known as "hypnotics" or, simply, sleep medicines. There are many different sleep medicines available to help people sleep better. Insomnia is often transient and intermittent. It usually requires treatment for only a short time, usually 7 to 10 days up to 2 weeks. If your insomnia does not improve after 7 to 10 days of treatment, see your doctor, because it may be a sign of an underlying condition. Some people have chronic sleep problems that may require more prolonged use of sleep medicine. However, you should not use these medicines for long periods without talking with your doctor about the risks and benefits of prolonged use.

Side Effects

All medicines have side effects. The most common side effects of sleep medicines are:

- Drowsiness
- Dizziness
- Lightheadedness
- Difficulty with coordination

Sleep medicines can make you sleepy during the day. How drowsy you feel depends upon how your body reacts to the medicine, which sleep medicine you are taking, and how large a dose your doctor has prescribed. Daytime drowsiness is best avoided by taking the lowest dose possible that will still help you sleep at night. Your doctor will work with you to find the dose of LUNESTA that is best for you. Some people taking LUNESTA have reported next-day sleepiness.

To manage these side effects while you are taking this medicine:

- When you first start taking LUNESTA or any other sleep medicine, until you know whether the medicine will still have some effect on you the next day, use extreme care while doing anything that requires complete alertness, such as driving a car, operating machinery, or piloting an aircraft.
- Do not drink alcohol when you are taking LUNESTA or any sleep medicine. Alcohol can increase the side effects of LUNESTA or any other sleep medicine.
- Do not take any other medicines without asking your doctor first. This includes medicines you can buy without a prescription. Some medicines can cause drowsiness and are best avoided while taking LUNESTA.
- Always take the exact dose of LUNESTA prescribed by your doctor. Never change your dose without talking to your doctor first.

Special Concerns

There are some special problems that may occur while taking sleep medicines.

Memory Problems

Sleep medicines may cause a special type of memory loss or "amnesia." When this occurs, a person may not remember what has happened for several hours after taking the medicine. This is usually not a problem since most people fall asleep after taking the medicine. Memory loss can be a problem, however, when sleep medicines are taken while traveling, such as during an airplane flight and the person wakes up before the effect of the medicine is gone. This has been called "traveler's amnesia." Memory problems have been reported rarely by patients taking LUNESTA in clinical studies. In most cases, memory problems can be avoided if you take LUNESTA only when you are able to

get a full night of sleep before you need to be active again. Be sure to talk to your doctor if you think you are having memory problems.

Tolerance

When sleep medicines are used every night for more than a few weeks, they may lose their effectiveness in helping you sleep. This is known as "tolerance." Development of tolerance to LUNESTA was not observed in a clinical study of 6 months' duration. Insomnia is often transient and intermittent, and prolonged use of sleep medicines is generally not necessary. Some people, though, have chronic sleep problems that may require more prolonged use of sleep medicine. If your sleep problems continue, consult your doctor, who will determine whether other measures are needed to overcome your sleep problems.

Dependence

Sleep medicines can cause dependence in some people, especially when these medicines are used regularly for longer than a few weeks or at high doses. Dependence is the need to continue taking a medicine because stopping it is unpleasant. When people develop dependence, stopping the medicine suddenly may cause unpleasant symptoms (see *Withdrawal* below). They may find they have to keep taking the medicine either at the prescribed dose or at increasing doses just to avoid withdrawal symptoms.

All people taking sleep medicines have some risk of becoming dependent on the medicine. However, people who have been dependent on alcohol or other drugs in the past may have a higher chance of becoming addicted to sleep medicines. This possibility must be considered before using these medicines for more than a few weeks. If you have been addicted to alcohol or drugs in the past, it is important to tell your doctor before starting LUNESTA or any sleep medicine.

Withdrawal

Withdrawal symptoms may occur when sleep medicines are stopped suddenly after being used daily for a long time. In some cases, these symptoms can occur even if the medicine has been used for only a week or two. In mild cases, withdrawal symptoms may include unpleasant feelings. In more severe cases, abdominal and muscle cramps, vomiting, sweating, shakiness, and, rarely, seizures may occur. These more severe withdrawal symptoms are very uncommon. Although withdrawal symptoms have not been observed in the relatively limited controlled trials experience with LUNESTA, there is, nevertheless, the risk of such events in association with the use of any sleep medicine.

Another problem that may occur when sleep medicines are stopped is known as "rebound insomnia." This means that a person may have more trouble sleeping the first few nights after the medicine is stopped than before starting the medicine. If you should experience rebound insomnia, do not get discouraged. This problem usually goes away on its own after 1 or 2 nights.

If you have been taking LUNESTA or any other sleep medicine for more than 1 or 2 weeks, do not stop taking it on your own. Always follow your doctor's directions.

Changes In Behavior And Thinking

Some people using sleep medicines have experienced unusual changes in their thinking and/or behavior. These effects are not common. However, they have included:

- More outgoing or aggressive behavior than normal
- Confusion
- Strange behavior
- Agitation
- Hallucinations
- Worsening of depression
- Suicidal thoughts

How often these effects occur depends on several factors, such as a person's general health, the use of other medicines, and which sleep medicine is being used. Clinical experience with LUNESTA suggests that it is rarely associated with these behavior changes.

It is also important to realize it is rarely clear whether these behavior changes are caused by the medicine, are caused by an illness, or have occurred on their own. In fact, sleep problems that do not

improve may be due to illnesses that were present before the medicine was used. If you or your family notice any changes in your behavior, or if you have any unusual or disturbing thoughts, call your doctor immediately.

Pregnancy And Breastfeeding

Sleep medicines may cause sedation or other potential effects in the unborn baby when used during the last weeks of pregnancy. Be sure to tell your doctor if you are pregnant, if you are planning to become pregnant, or if you become pregnant while taking LUNESTA.

In addition, a very small amount of LUNESTA may be present in breast milk after use of the medication. The effects of very small amounts of LUNESTA on an infant are not known; therefore, as with all other prescription sleep medicines, it is recommended that you not take LUNESTA if you are breastfeeding a baby.

Safe Use Of Sleep Medicines

To ensure the safe and effective use of LUNESTA or any other sleep medicine, you should observe the following cautions:

1. LUNESTA is a prescription medicine and should be used ONLY as directed by your doctor. Follow your doctor's instructions about how to take, when to take, and how long to take LUNESTA.
2. Never use LUNESTA or any other sleep medicine for longer than directed by your doctor.
3. If you notice any unusual and/or disturbing thoughts or behavior during treatment with LUNESTA or any other sleep medicine, contact your doctor.
4. Tell your doctor about any medicines you may be taking, including medicines you may buy without a prescription and herbal preparations. You should also tell your doctor if you drink alcohol. DO NOT use alcohol while taking LUNESTA or any other sleep medicine.
5. Do not take LUNESTA unless you are able to get 8 or more hours of sleep before you must be active again.
6. Do not increase the prescribed dose of LUNESTA or any other sleep medicine unless instructed by your doctor.
7. When you first start taking LUNESTA or any other sleep medicine, until you know whether the medicine will still have some effect on you the next day, use extreme care while doing anything that requires complete alertness, such as driving a car, operating machinery, or piloting an aircraft.
8. Be aware that you may have more sleeping problems the first night or two after stopping any sleep medicine.
9. Be sure to tell your doctor if you are pregnant, if you are planning to become pregnant, if you become pregnant, or if you are breastfeeding a baby while taking LUNESTA.
10. As with all prescription medicines, never share LUNESTA or any other sleep medicine with anyone else. Always store LUNESTA or any other sleep medicine in the original container and out of reach of children.
11. Be sure to tell your doctor if you suffer from depression.
12. LUNESTA works very quickly. You should only take LUNESTA immediately before going to bed.
13. For LUNESTA to work best, you should not take it with or immediately after a high-fat, heavy meal.
14. Some people, such as older adults (i.e., ages 65 and over) and people with liver disease, should start with the lower dose (1 mg) of LUNESTA. Your doctor may choose to start therapy at 2 mg. In general, adults under age 65 should be treated with 2 or 3 mg.
15. Each tablet is a single dose; do not crush or break the tablet.

Note: This summary provides important information about LUNESTA. If you would like more information, ask your doctor or pharmacist to let you read the Prescribing Information and then discuss it with him or her.

Rx only



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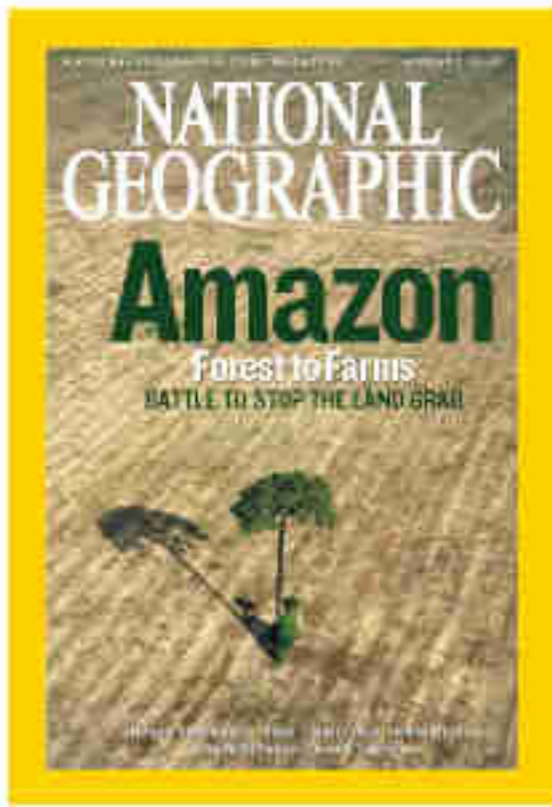
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January 2007 *Reader Joanne Moore of Hunters Hill, New South Wales, commented on the cover photograph. "Has anyone noticed the shadow cast from the smaller trees?" she wrote. "It looks like a forlorn human figure, stomach distended from malnutrition, seeking the last remnants of shade from the last lone tree. Does this photo sneak a look into the future?"*

➤ [Comment on May stories at **ngm.com**.](#)

Amazon, Forest to Farms

You do not have to go to Brazil to see the devastation of over-development. I grew up in southeastern Pennsylvania in the 1960s and '70s. Behind my parents' home was a piece of property comprising woods, open land, and a small stream. The property was owned by a dairy farmer and was used by the local children as well as by his herd. I spent many a sum-

mer day roaming those woods, building forts, and playing games while developing my love of nature. The children and the cows are long gone. After its sale, the property was logged and a large building was placed on one of the open fields. I recently took a walk through my former playground and was shocked at what I saw. About 95 percent of the trees were cut down. This area of

Pennsylvania is being stripped of its natural heritage at such a rapid pace that in the next few decades there will be no open space left.

JEANNETTE FITZSIMONS MOORE
Downington, Pennsylvania

The description of the brutal murder of Dorothy Stang deeply moved me. This courageous woman put her life on the line as she resisted the destruction of the Amazon rain forest and the human communities that it sustains. For mindless, short-term gain, humans continue to escalate the infliction of violence on the Earth. Let us hope that the human race will awaken in time to save itself from itself.

WILLIAM T. NOLAN
Detroit, Michigan

My name is David Stang. I am the youngest brother of Dorothy Stang. I have been to Brazil seven times since my sister's cowardly murder. I am appalled that the governor of Mato Grosso has had the arrogance to imply that she was marching in the wrong direction regarding the future economy of Brazil. So one farmer for every 300 acres is the future? So does the governor believe that democracy and economy for the many is created with so much power and wealth in his hands? In my heart and mind, I know that Dorothy was marching in the right direction—educating the poor and creating jobs. It seems the governor has no respect for her opinion. Where

is his support for justice and trials for those who murdered my sister?

DAVID STANG
Palmer Lake, Colorado

No country truly practices sustainable farming techniques; we are always to some extent mining the soil. Agriculture as an industry is one of the largest polluters on the planet. Increasing the demand for corn and soybeans by making motor fuels with them will only increase deforestation of the Amazon Basin. I hope I don't have to tell my grandchildren someday that the reason a loaf of bread costs a hundred dollars and the rain forest is gone is because in the old days we used to burn corn and soybeans to fuel our

cars. At best, fuel made from crops will be a short-term stopgap to the oil shortage, but the long-term damage to the environment as a result may be permanent.

RANDY VAN DER AA
Kingsport, Tennessee

As a forester with 23 years of experience, I too love the woods. Nonetheless, I also

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Include name, address, and daytime telephone. Letters may be edited for clarity and length.

A tree is a plant, no more, no less. It is no problem at all to reconcile harvesting trees with loving the forest. Ask any forester. As to Brazil, the surest way to continue the destruction of the Amazonian forest (or any tropical timber) is to attempt to conserve it all, irrespective of the needs and wants of all the people who live there and who do not really fancy being "conserved" to satisfy the emotional needs of some Americans thousands of miles distant.

LEONARD M. GUSS
Woodinville, Washington

More research would have shown that the region's problems began long before the beginning of soybean production. Nevertheless, the Brazilian Association of Vegetable Oil Industries (ABIOVE) is aware of its responsibilities and has dedicated resources to the question of sustainable development.

CARLO LOVATELLI
President, ABIOVE
São Paulo, Brazil

Dubai, the Sudden City

I wish the piece on the explosive growth of Dubai had told us how the shopping center's faux ski slope is being cooled.

Corrections, Clarifications

January 2007:

Wildlife: Losing Ground The pronghorn antelope migration is the longest of any land mammal in the lower 48 states.

Geography: What's in a Name The most popular U.S. baby names in 1915 were John and Mary.

Arctic Dreams & Nightmares (page 148) Vasodilators improve blood circulation; they do not thin blood.

With the temperature at 110°F outside, one can only imagine the greenhouse gases being created by this weird consumer treat—machine-made snow, "a small white miracle in the desert of Arabia." This is no miracle. It's a poster child for global warming.

BRUCE E. JOHANSEN
Omaha, Nebraska

Giant synthetic islands shaped like palm trees, covered in fashion boutiques and hotels, the Eighth Wonder of the World? They are the benchmark of ugliness. Also, think of the carbon footprint: gigantic.

DYLAN HUMPHRIES
Bristol, England

Workers underpaid or not paid at all for long periods, laboring for 12 hours a day and unable to return home, living in slum conditions. Most of the world would call that slavery. One might wonder just how well those buildings are constructed under those conditions.

PETE HARDING
Gardnerville, Nevada

Arctic Dreams & Nightmares

I found a curious connection between "Arctic Dreams & Nightmares" and "A Survivor's Story," by John Dau. The men in these stories overcame amazing difficulties to survive. However, whereas the Arctic explorers sought out their hell, the lost boys were swept into theirs by Sudan's civil war. These similar yet vastly different stories speak about the separateness of our human experience. They make me wonder, Who are our true heroes?

PAULIINA SWARTZ
West Newbury, Massachusetts



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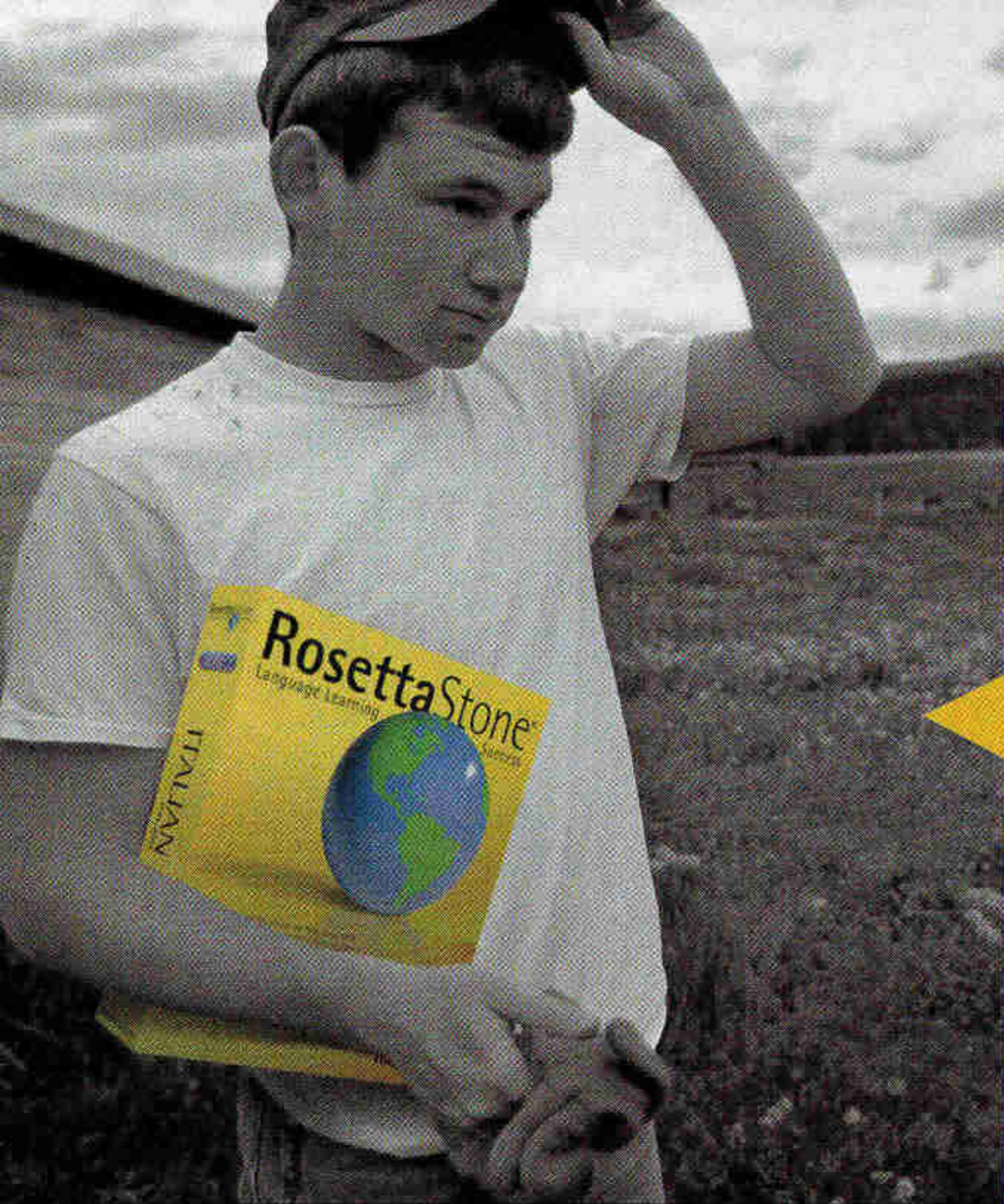
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He was a hardworking farm boy.

She was an Italian supermodel.


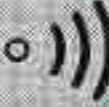


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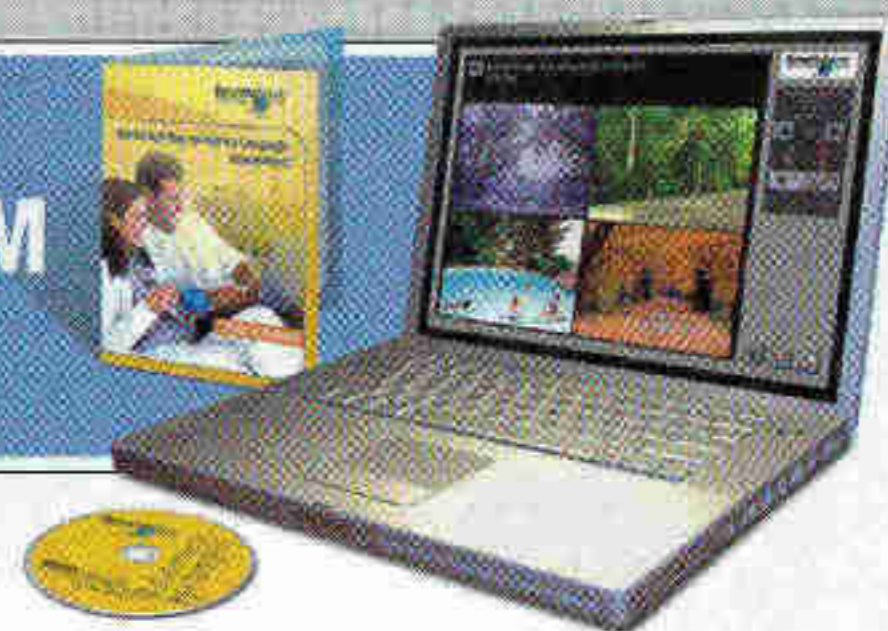
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LETTERS

We are used to seeing extreme sports and reality shows with carefully controlled dangers. Marguerite Del Giudice shows endurance and suffering in an entirely different light, making the flickering images on TV sets pale by comparison.

DENNIS G. BUKI
Washington, D.C.

I find no saving grace in their self-imposed nightmarish trek. Why not just lock themselves in a cold storage locker with adequate food and provisions so they can prove their manhood.

JUNE McBRIDE
Hauser, Idaho

I simply cannot comprehend the sheer guts it takes to venture out in the dark, day after

day, at the temperatures these adventurers faced. Some could dismiss it as a high-risk, high-cost, and unnecessarily crazy trek. I can only say I was left with nothing but admiration for their craziness.

DAVID WATSON
Sydney, New South Wales

Flight of Fancy

I was interested to read about hummingbirds' aggressive, territorial nature, having seen a ruby-throated hummingbird fighting with a tiger swallowtail butterfly over the phlox in our garden, beating each other with their little wings. I waved my arms at them and yelled, "Shame on you—two of God's beautiful little creatures! A whole garden full of phlox and you

fight over one blossom!" Looks like I shouldn't have been surprised.

PATRICIA FREDERICK
Ashburnham, Massachusetts

We have a hummingbird feeder on our balcony, ready and waiting for the tiny visitors by mid-May every year. I couldn't agree more that their language consists mostly of swear words. To watch them squaring off in the middle of the air and facing each other is breathtaking. They are like miniature jet fighter planes chasing each other. I don't think that real fighter pilots could keep up with them when it comes to maneuvering.

PAUL KARBUSICKY
Fredericton, New Brunswick

Voices: A Survivor's Story

So glad John Dau has survived and has returned to help. Now, what of the women of southern Sudan. Do we somehow expect that they were (or are) being slaughtered any less than the men and boys? What foolishness to save the men and lose the women who will bear and educate the next generations of the Dinka.

KATHLEEN FLACY
College Station, Texas

Geography: What's in a Name

I couldn't help but notice that the writer of your piece on the most popular names is unlikely to make the list herself. In my 46 years, I've only met two Siobhans and know of a

dozen or so others. (In Ireland it's possible to find coffee mugs and cheap plastic key-chains with our name on them—one more reason to visit.) We know we'll be asked to spell it out, then we'll have to spend another moment correcting the spelling and nodding along with the notion that you sure wouldn't guess that's how you pronounce it. It's a small trade-off for staying out of the mainstream.

SIOBHAN RUCK
San Francisco, California

Science: The Mystery of Snowflakes

How and why snowflakes form such a variety of shapes should remain a mystery. Don't try to explain such beauty in scientific terms. It

seems to me that there must be many other ways to learn about global climate. Please let us have the innocent fun of trying to compare the snowflakes before they melt!

DORIS SAYER
New London, New Hampshire

I was one of those kids who sprawled on my back during snowstorms to watch the flakes dance lazily to the ground. It is encouraging for me to think that my own child will not have an idea of generic asymmetrical snowflakes but rather envision needles, columns, and polygons.

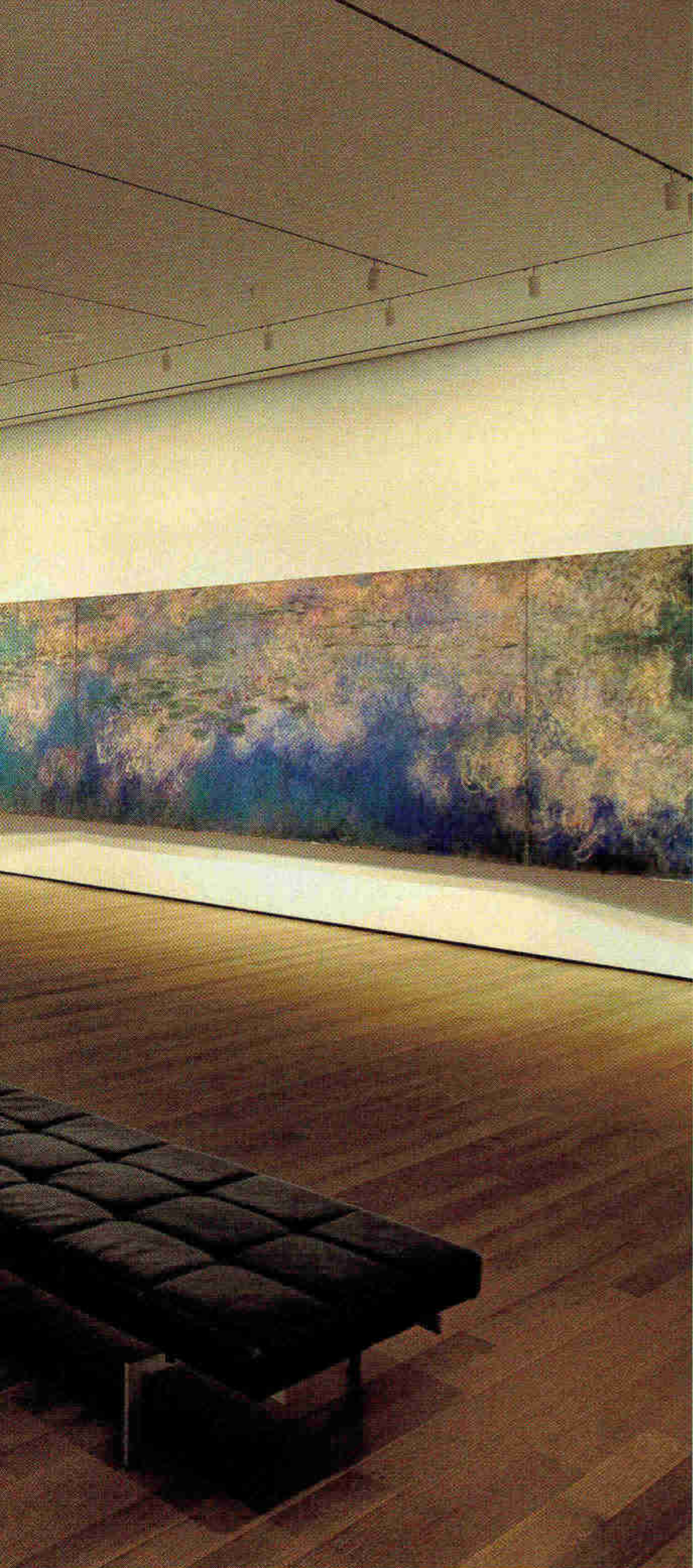
EMILY RIVERA
Lakewood, Colorado



Things to do while you're alive:

- Learn to fly-fish at Inverlochy Castle
- Visit an uninhabited island
- Celebrate St. Patty's Day in Dublin
- Deep-sea fish and eat your catch
- Camp on Seven Mile Beach
- Write a screenplay
- See the Leaning Tower of Pisa
- Drink a margarita on Isla Margarita
- Shoot a hole in one
- Watch a space shuttle launch
- See a penguin in its natural habitat
- Climb an eighteener
- Travel with handmade fitted luggage
- Find the Big Dipper
- Look down from the Cliffs of Moher
- Take your parents on a vacation
- Eat an insect
- Run with the bulls in Pamplona
- Win a karaoke contest
- Have a museum all to yourself

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Reach For It Good pictures like these are within your grasp. This month, our editors liked a sunbathing chameleon snapped on the photographer's balcony and a great shot of a space shot. Submit one of your own images—on any topic—for possible publication in an upcoming issue of NATIONAL GEOGRAPHIC. For guidelines, a submission form, and more information, go to ngm.com/yourshot.

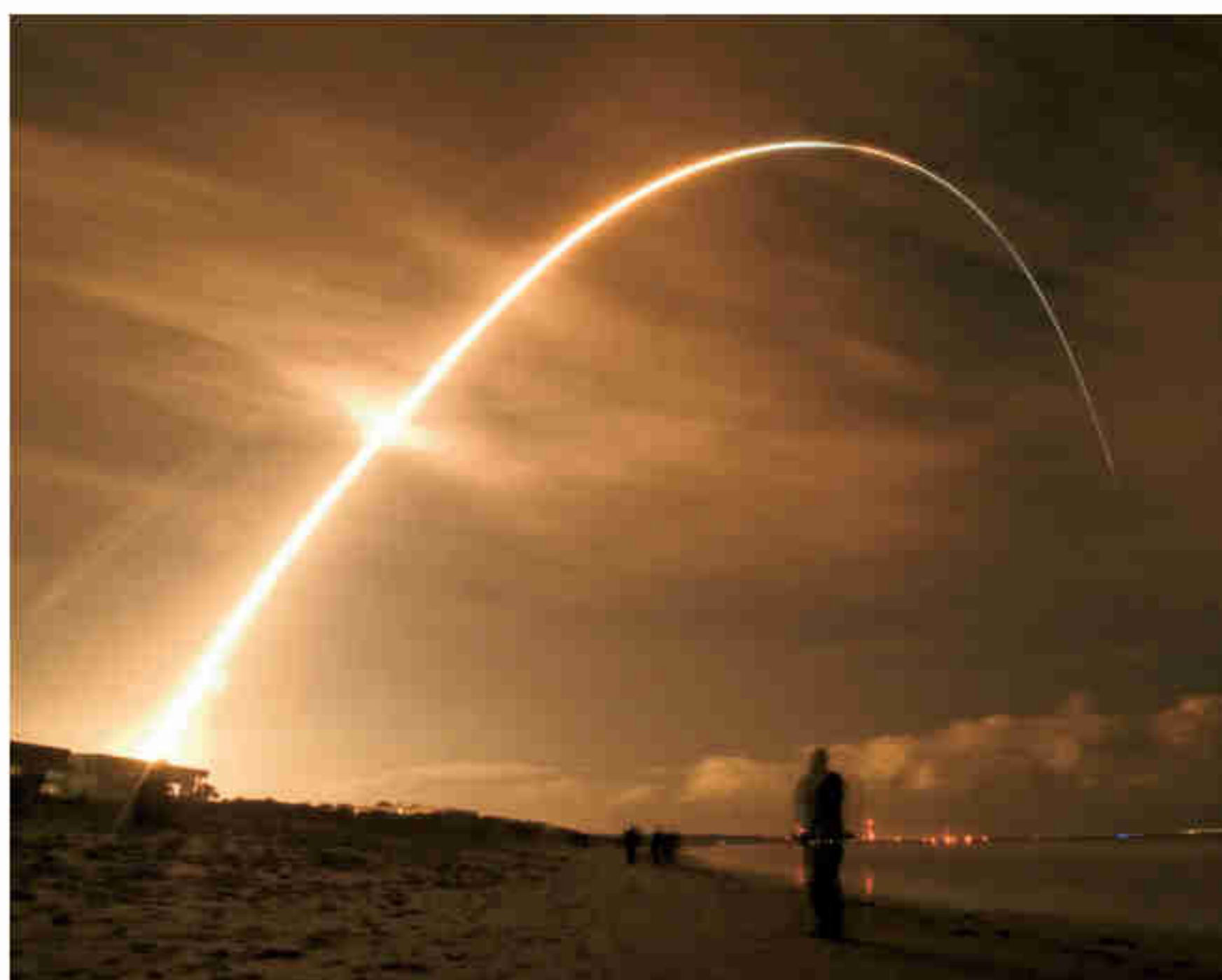


Igor Siwanowicz Munich, Germany

His pet veiled chameleon was “either cold or not totally happy,” says Igor Siwanowicz, 30, a postdoctoral fellow at the Max Planck Institute for Biochemistry. “Contrary to popular belief, color change is an expression of the lizard’s physical condition and mood rather than an adaptation to surroundings.”

Ryan Smith Cape Canaveral, Florida

A six-minute exposure scraped the space shuttle’s launch path across a night sky last December. Ryan Smith, a 27-year-old engineer, used mapping and space websites to determine the best time and place to get the picture.

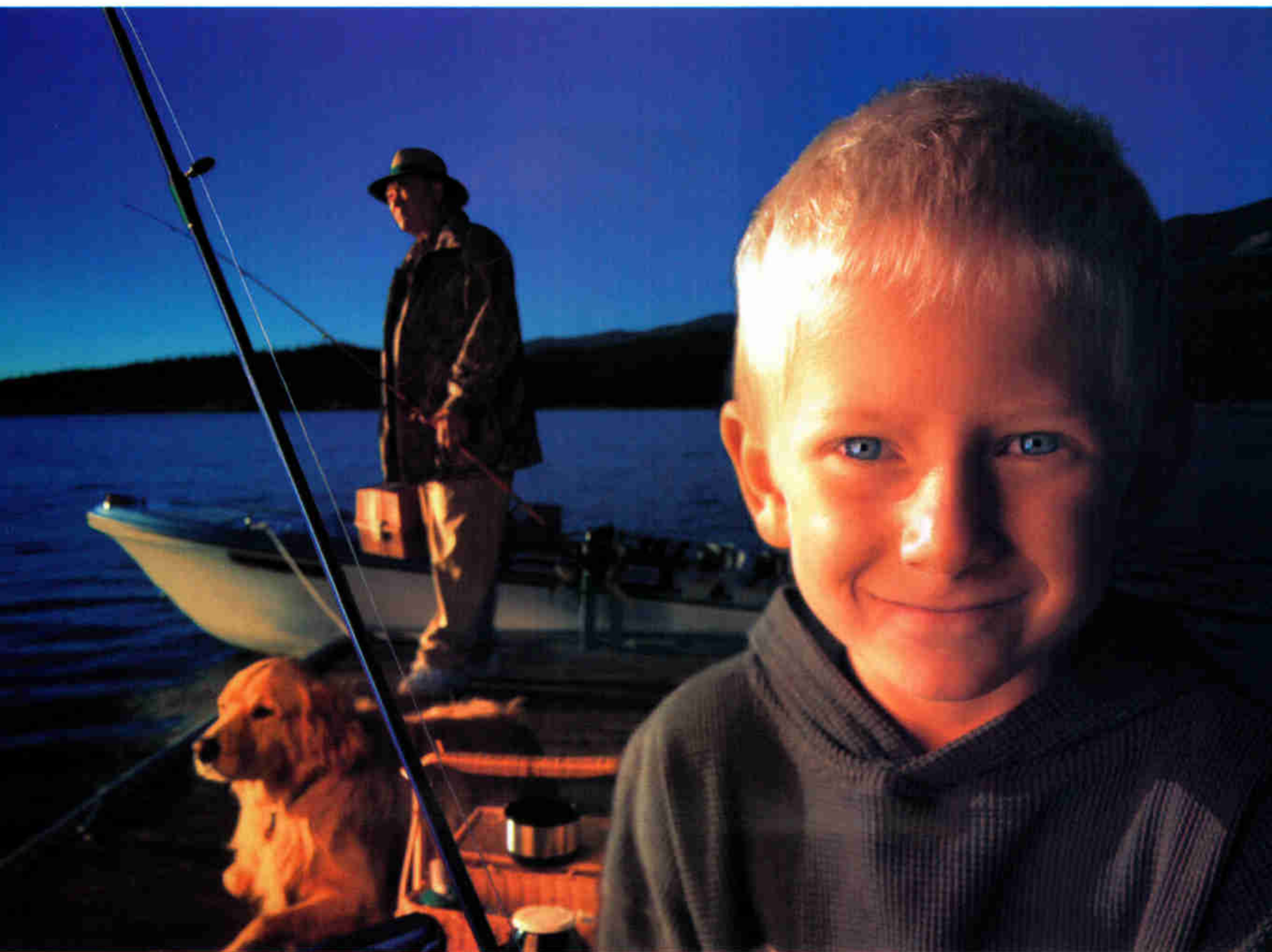


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New York, New York



San Francisco, California



Olney, Texas



Randolph, Kansas



Robert Clark, a longtime *GEOGRAPHIC* contributor, logged nearly 10,000 miles for his 2005 Image America project.

America by Phone Some wise and accomplished photographers told me it might be a very bad idea. A cell phone company had offered me nearly two months to capture a vision of America, with one hitch: I had to do it all with a camera phone. And upload to a public website every day. What if I couldn't deliver quality images?

But shooting a cross-country epic was a dream of mine, inspired by the work of Robert Frank, the Depression-era Farm Security Administration photographers, and great journey stories from John Steinbeck's *Travels with Charley* to Jack Kerouac's *On the Road* and William Least Heat-Moon's *Blue Highways*. Lots of stuff I do now is intensively lit, painstakingly produced photography. This project took me back to the basics—back to my own beginnings as a feature-hunting newspaper photographer.

Starting from my home in New York (top left) I wound up making some 200 pictures a day for 50 days: my niece Dora in her prom dress, a guy dressed up like the Easter Bunny to promote a San Francisco toy store, a poster for a one-armed dove hunt in Texas. The simplicity of the equipment seemed to make it easier to connect with people, mile after mile.

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When do you tell it that it's not a sports car?

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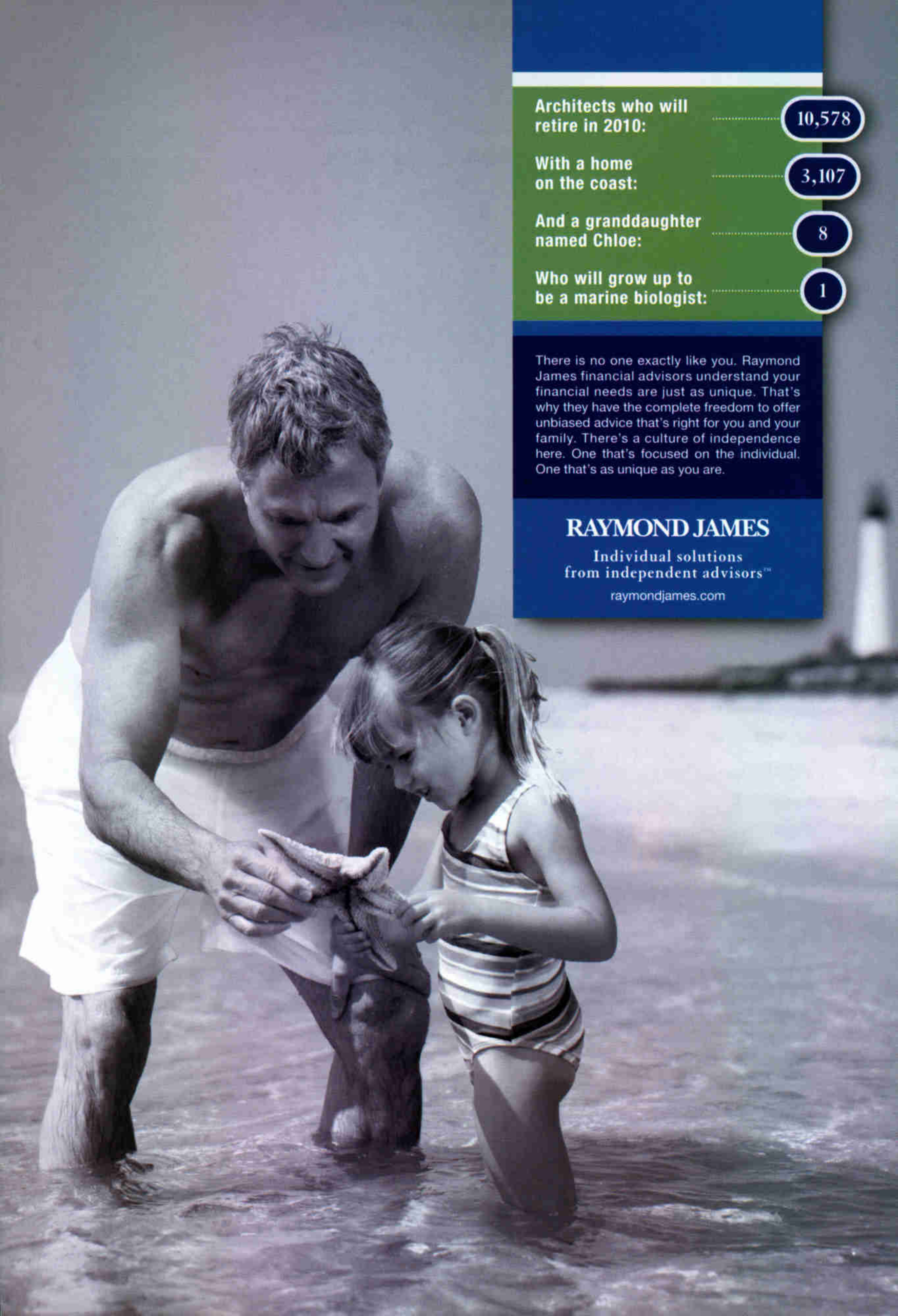
Giving creates positive change in people's lives. And, for you, sharing your good fortune has become a natural – and fulfilling – aspect of your financial success.

But even the simple act of giving can sometimes get complicated, especially if you are exceptionally generous. When should you donate? What financial implications do you need to consider? How do you find time to manage all these issues?

The Raymond James Charitable Endowment Fund could be the right solution. Instead of donating directly to your charities or establishing a charitable trust, you make contributions to an investment account held in your name. As a

donor-advised fund, this alternative simplifies the process by managing your assets and making charitable grants to your chosen charities on your behalf. So, you can enjoy the pleasure of giving without the hassles of timing, complex tax concerns, expense, and recordkeeping.

- Relatively low initial contribution to establish (often \$10,000)
- Funds grow tax-free – charity can garner more than original contribution
- Donors can receive immediate income tax deduction up to 50% of AGI
- Funds can eliminate capital gains, gift and/or estate taxes on contribution



Architects who will
retire in 2010:

10,578

With a home
on the coast:

3,107

And a granddaughter
named Chloe:

8

Who will grow up to
be a marine biologist:

1

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Sylvan Grove, Kansas



New Orleans, Louisiana



Las Vegas, Nevada



Near Redwood National Park, California



New York, New York



New York, New York

Before leaving New York, I recorded Orthodox Jews in Brooklyn walking home through the slanting light of a winter afternoon (bottom right) and my nephew Luca smiling through Christo and Jeanne-Claude's "Gates" in Central Park (bottom left). Farther afield, a doll-and-rosary memorial beside a California highway seemed both mournful and bizarre. Portraits of ebullient glamour appeared nearly 1,500 miles apart: Jacquelyne Holland prepping for a Las Vegas show (center left) and singer Pat "Mother Blues" Cohen in New Orleans (top right). I returned to an iconic church I'd struggled to photograph as a Kansas State student (top left), and finally made the picture I wanted.



ADVAIR[®] significantly improves lung function to help you breathe better.*

If you have COPD associated with chronic bronchitis, ADVAIR 250/50 may help. ADVAIR is different from other COPD medications. ADVAIR is the only product with an anti-inflammatory and a bronchodilator working together to improve lung function.

Get your first full prescription FREE!
Go to AdvairCOPD.com or call 1-800-987-4900.
Ask your doctor about ADVAIR today.



The way anti-inflammatories work in the treatment of COPD is not well defined.

Important Information: ADVAIR DISKUS 250/50 is approved for controlling symptoms and preventing wheezing in adults with COPD associated with chronic bronchitis. The benefit of using ADVAIR for longer than 6 months has not been evaluated. You should only take 1 inhalation of ADVAIR twice a day. Taking higher doses will not provide additional benefits but may increase your chance of certain side effects. Lower respiratory tract infections, including pneumonia, have been reported with ADVAIR. Patients at risk for developing bone loss (osteoporosis) and some eye problems (cataracts or glaucoma) should be aware that use of inhaled corticosteroids, including ADVAIR, may increase your risk. You should consider having regular eye exams. ADVAIR does not replace fast-acting inhalers for acute symptoms.

*Measured by a breathing test in people taking ADVAIR 250/50, compared with people taking either fluticasone propionate 250 mcg or salmeterol 50 mcg. Your results may vary.



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ADVAIR DISKUS[®] 250/50
(fluticasone propionate 250 mcg and salmeterol 50 mcg inhalation powder)

If you smoke and want to quit, you can learn more at way2quit.com.

*Subject to eligibility. Restrictions apply. Please see accompanying important information about ADVAIR DISKUS 250/50.

ADVAIR DISKUS[®] 100/50, 250/50, 500/50

(fluticasone propionate 100, 250, 500 mcg and salmeterol 50 mcg inhalation powder)

What is the most important information I should know about ADVAIR DISKUS?

In patients with asthma, long-acting beta₂-agonist medicines such as salmeterol (one of the medications in ADVAIR[®]) may increase the chance of death from asthma problems. In a large asthma study, more patients who used salmeterol died from asthma problems compared with patients who did not use salmeterol. So ADVAIR is not for patients whose asthma is well controlled on another asthma controller medicine such as low- to medium-dose inhaled corticosteroids or only need a fast-acting inhaler once in a while. Talk with your doctor about this risk and the benefits of treating your asthma with ADVAIR.

ADVAIR should not be used to treat a severe attack of asthma or chronic obstructive pulmonary disease (COPD) requiring emergency medical treatment.

ADVAIR should not be used to relieve sudden symptoms or sudden breathing problems. Always have a fast-acting inhaler with you to treat sudden breathing difficulty. If you do not have a fast-acting inhaler, contact your doctor to have one prescribed for you.

What is ADVAIR DISKUS?

There are two medicines in ADVAIR: Fluticasone propionate, an inhaled anti-inflammatory belonging to a group of medicines commonly referred to as corticosteroids; and salmeterol, a long-acting, inhaled bronchodilator belonging to a group of medicines commonly referred to as beta₂-agonists. There are 3 strengths of ADVAIR: 100/50, 250/50, 500/50.

For Asthma

- ADVAIR is approved for the maintenance treatment of asthma in patients 4 years of age and older. ADVAIR should only be used if your doctor decides that another asthma controller medicine alone does not control your asthma or that you need 2 asthma controller medications.
- The strength of ADVAIR approved for patients ages 4 to 11 years who experience symptoms on an inhaled corticosteroid is ADVAIR DISKUS 100/50. All 3 strengths are approved for patients with asthma ages 12 years and older.

For COPD associated with chronic bronchitis

ADVAIR 250/50 is the only approved dose for the maintenance treatment of airflow obstruction in patients with COPD associated with chronic bronchitis. The benefit of using ADVAIR for longer than 6 months has not been evaluated. The way anti-inflammatories work in the treatment of COPD is not well defined.

Who should not take ADVAIR DISKUS?

You should not start ADVAIR if your asthma is becoming significantly or rapidly worse, which can be life threatening. Serious respiratory events, including death, have been reported in patients who started taking salmeterol in this situation, although it is not possible to tell whether salmeterol contributed to these events. This may also occur in patients with less severe asthma.

You should not take ADVAIR if you have had an allergic reaction to it or any of its components (salmeterol, fluticasone propionate, or lactose). Tell your doctor if you are allergic to ADVAIR, any other medications, or food products. If you experience an allergic reaction after taking ADVAIR, stop using ADVAIR immediately and contact your doctor. Allergic reactions are when you experience one or more of the following: choking; breathing problems; swelling of the face, mouth and/or tongue; rash; hives; itching; or welts on the skin.

Tell your doctor about the following:

- If you are using your fast-acting inhaler more often or using more doses than you normally do (e.g., 4 or more inhalations of your fast-acting inhaler for 2 or more days in a row or a whole canister of your fast-acting inhaler in 8 weeks' time), it could be a sign that your asthma is getting worse. If this occurs, tell your doctor immediately.
- If you have been using your fast-acting inhaler regularly (e.g., four times a day). Your doctor may tell you to stop the regular use of these medications.
- If your peak flow meter results decrease. Your doctor will tell you the numbers that are right for you.
- If you have asthma and your symptoms do not improve after using ADVAIR regularly for 1 week.
- If you have been on an oral steroid, like prednisone, and are now using ADVAIR. You should be very careful as you may be less able to heal after surgery, infection, or serious injury. It takes a number of months for the body to recover its ability to make its own steroid hormones after use of oral steroids. Switching from an oral steroid may also unmask a condition previously suppressed by the oral steroid such as allergies, conjunctivitis, eczema, arthritis, and eosinophilic conditions. Symptoms of an eosinophilic condition can include rash, worsening breathing problems, heart complications, and/or feeling of "pins and needles" or numbness in the arms and legs. Talk to your doctor immediately if you experience any of these symptoms.
- Sometimes patients experience unexpected bronchospasm right after taking ADVAIR. This condition can be life threatening and if it occurs, you should immediately stop using ADVAIR and seek immediate medical attention.
- If you have any type of heart disease such as coronary artery disease, irregular heart beat or high blood pressure, ADVAIR should be used with caution. Be sure to talk with your doctor about your condition because salmeterol, one of the components of ADVAIR, may affect the heart by increasing heart rate and blood pressure. It may cause symptoms such as heart fluttering, chest pain, rapid heart rate, tremor, or nervousness.
- If you have seizures, overactive thyroid gland, liver problems, or are sensitive to certain medications for breathing.
- If your breathing problems get worse over time or if your fast-acting inhaler does not work as well for you while using ADVAIR. If your breathing problems worsen quickly, get emergency medical care.
- If you have been exposed to or currently have chickenpox or measles or if you have an immune system problem. Patients using medications that weaken the immune system are more likely to get infections than healthy individuals. ADVAIR contains a corticosteroid (fluticasone propionate) which may weaken the immune system. Infections like chickenpox and measles, for example, can be very serious or even fatal in susceptible patients using corticosteroids.

How should I take ADVAIR DISKUS?

ADVAIR should be used 1 inhalation, twice a day (morning and evening). ADVAIR should never be taken more than 1 inhalation twice a day. The full benefit of taking ADVAIR may take 1 week or longer.

If you miss a dose of ADVAIR, just skip that dose. Take your next dose at your usual time. Do not take two doses at one time.

Do not stop using ADVAIR unless told to do so by your doctor because your symptoms might get worse.

Do not change or stop any of your medicines used to control or treat your breathing problems. Your doctor will adjust your medicines as needed.

When using ADVAIR, remember:

- Never breathe into or take the DISKUS[®] apart.
- Always use the DISKUS in a level position.
- After each inhalation, rinse your mouth with water without swallowing.
- Never wash any part of the DISKUS. Always keep it in a dry place.
- Never take an extra dose, even if you feel you did not receive a dose.
- Discard 1 month after removal from the foil overwrap.
- Do not use ADVAIR with a spacer device.

Children should use ADVAIR with an adult's help as instructed by the child's doctor.

Can I take ADVAIR DISKUS with other medications?

Tell your doctor about all the medications you take, including prescription and nonprescription medications, vitamins, and herbal supplements.

If you are taking ADVAIR, you should not take SEREVENT[®] DISKUS or Foradil[®] Aerolizer[®] for any reason.

If you take ritonavir (an HIV medication), tell your doctor. Ritonavir may interact with ADVAIR and could cause serious side effects. The anti-HIV medicines Norvir[®] Soft Gelatin Capsules, Norvir Oral Solution, and Kaletra[®] contain ritonavir.

No formal drug interaction studies have been performed with ADVAIR.

In clinical studies, there were no differences in effects on the heart when ADVAIR was taken with varying amounts of albuterol. The effect of using ADVAIR in patients with asthma while taking more than 9 puffs a day of albuterol has not been studied.

ADVAIR should be used with extreme caution during and up to 2 weeks after treatment with monoamine oxidase (MAO) inhibitors or tricyclic antidepressants since these medications can cause ADVAIR to have an even greater effect on the circulatory system.

ADVAIR should be used with caution in people who are taking ketoconazole (an antifungal medication) or other drugs broken down by the body in a similar way. These medications can cause ADVAIR to have greater steroid side effects.

Generally, people with asthma should not take beta-blockers because they counteract the effects of beta₂-agonists and may also cause severe bronchospasm. However, in some cases, for instance, following a heart attack, selective beta-blockers may still be used if there is no acceptable alternative.

The ECG changes and/or low blood potassium that may occur with some diuretics may be made worse by ADVAIR, especially at higher-than-recommended doses. Caution should be used when these drugs are used together.

In clinical studies, there was no difference in side effects when ADVAIR was taken with methylxanthines (e.g., theophylline) or with FLONASE[®].

What are other important safety considerations with ADVAIR DISKUS?

Osteoporosis: Long-term use of inhaled corticosteroids may result in bone loss (osteoporosis). Patients who are at risk for increased bone loss (tobacco use, advanced age, inactive lifestyle, poor nutrition, family history of osteoporosis, or long-term use of drugs such as corticosteroids) may have a greater risk with ADVAIR. If you have risk factors for bone loss, you should talk to your doctor about ways to reduce your risk and whether you should have your bone density evaluated.

Glaucoma and cataracts: Glaucoma, increased pressure in the eyes, and cataracts have been reported with the use of inhaled steroids, including fluticasone propionate, a medicine contained in ADVAIR. Regular eye examinations should be considered if you are taking ADVAIR.

Lower respiratory tract infection: Lower respiratory tract infections, including pneumonia, have been reported with the use of inhaled corticosteroids, including ADVAIR.

Blood sugar: Salmeterol may affect blood sugar and/or cause low blood potassium in some patients, which could lead to a side effect like an irregular heart rate. Significant changes in blood sugar and blood potassium were seen infrequently in clinical studies with ADVAIR.

Growth: Inhaled steroids may cause a reduction in growth velocity in children and adolescents.

Steroids: Taking steroids can affect your body's ability to make its own steroid hormones, which are needed during infections and times of severe stress to your body, such as an operation. These effects can sometimes be seen with inhaled steroids (but it is more common with oral steroids), especially when taken at higher-than-recommended doses over a long period of time. In some cases, these effects may be severe. Inhaled steroids often help control symptoms with less side effects than oral steroids.

Yeast infections: Patients taking ADVAIR may develop yeast infections of the mouth and/or throat ("thrush") that should be treated by their doctor.

Tuberculosis or other untreated infections: ADVAIR should be used with caution, if at all, in patients with tuberculosis, herpes infections of the eye, or other untreated infections.

What are the other possible side effects of ADVAIR DISKUS?

ADVAIR may produce side effects in some patients. In clinical studies, the most common side effects with ADVAIR included:

- | | | |
|--------------------------------|-----------------------|------------------------------------|
| • Respiratory infections | • Bronchitis | • Musculoskeletal pain |
| • Throat irritation | • Cough | • Dizziness |
| • Hoarseness | • Headaches | • Fever |
| • Sinus infection | • Nausea and vomiting | • Ear, nose, and throat infections |
| • Yeast infection of the mouth | • Diarrhea | • Nosebleed |

Tell your doctor about any side effect that bothers you or that does not go away. These are not all the side effects with ADVAIR. Ask your doctor or pharmacist for more information.

What if I am pregnant, planning to become pregnant, or nursing?

Talk to your doctor about the benefits and risks of using ADVAIR during pregnancy, labor, or if you are nursing. There have been no studies of ADVAIR used during pregnancy, labor, or in nursing women. Salmeterol is known to interfere with labor contractions. It is not known whether ADVAIR is excreted in breast milk, but other corticosteroids have been detected in human breast milk. Fluticasone propionate, like other corticosteroids, has been associated with birth defects in animals (e.g., cleft palate and fetal death). Salmeterol showed no effect on fertility in rats at 180 times the maximum recommended daily dose.

What other important tests were conducted with ADVAIR?

There is no evidence of enhanced toxicity with ADVAIR compared with the components administered separately. In animal studies with doses much higher than those used in humans, salmeterol was associated with uterine tumors. Your healthcare professional can tell you more about how drugs are tested on animals and what the results of these tests may mean to your safety.

For more information on ADVAIR DISKUS

This page is only a brief summary of important information about ADVAIR DISKUS. For more information, talk to your doctor. You can also visit www.ADVAIR.com or call 1-888-825-5249. Patients receiving ADVAIR DISKUS should read the medication guide provided by the pharmacist with the prescription.

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GlaxoSmithKline

GlaxoSmithKline
Research Triangle Park, NC 27709
RL-2260

"As a professional restorer of antique and classic watches for museums, including the Smithsonian, I recently reviewed the movement and individual parts of the Stauer 1779 Skeleton watch. The assembly and the precision of the mechanical movement are excellent."

*—George Thomas
Towson Watch Company*



No Bones About It

The Vintage Design of the Stauer 1779 Skeleton Reveals the Precision Inner Workings of a Great Machine.

We found our most interesting watch in our oldest history book. A trip to an antique book store led us to find one of the earliest designs of the sought after skeleton timepiece. With a 227-year-old design, Stauer has brought back the past in the intriguing old world geometry of the Stauer 1779 Skeleton. See right through to the precision parts and hand assembled movement and into the heart of the unique timepiece. It's like seeing an X-Ray inside the handsome gold filled case.



The open exhibition back allows you to further explore the intricate movement and fine craftsmanship.

Beauty is only skin deep but the Engineering Goes Right to the Bone. Intelligent Collectors of vintage mechanical watches have grown bored with mass produced quartz movements. Like fine antique car collectors, they look for authenticity, but they also want practicality from their tiny machines. Inspired by a rare museum piece dating to 1779, we engineered this classic with \$31,000,000 worth of precise Swiss built machinery to create the intricate gears and levers. So the historians are thrilled with the authenticity and the demanding engineers are quite impressed with the technical performance.

See All the Way Through. The crystal on the front and the see through exhibition back allow you to observe the gold-fused mainspring, escapement, balance wheel and many of the 20 rubies work in harmony. The balance wheel oscillates at 21,600 times per hour for superb accuracy. The crocodile embossed leather strap adjusts from 6 1/2" to 9" so it will fit practically any wrist. So give it a little wind and the gears roar to life.

The Time Machine. We took the timepiece to George Thomas, a noted historian and watch restorer

for museums such as the Smithsonian, and he dissected the 110 parts of the vintage movement. He gave the "1779" top reviews. "It is possible to build it better than the original, and your new skeleton requires so little maintenance." When we shared the price with him, George was stunned. He said that no other luxury skeleton can be had for under \$1000. But we pour our money into the watch construction, not into sponsoring yacht races and polo matches. We have been able to keep the price on

this collector's limited edition to only three payments of \$33.00. So you can wear a piece of watch making history and still keep most of your money in your pocket, not on your wrist. This incredible watch has an attractive price and comes with an exclusive 30-day in-home trial. If you're not completely satisfied with the performance and exquisite detail of this fine timepiece, simply return it for a full refund of your purchase price. There are only 4,999 in the limited edition, so please act quickly. Historical value rarely repeats itself.

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VISIONS OF EARTH



Queensland, Australia Massive clouds called morning glories roil over the Gulf of Carpentaria. Most common in September and October—and in morning—the clouds can travel across the skies at nearly 20 miles an hour.

PHOTO: BARRY SLADE



Mediterranean Sea The underside of a skate shimmers off the coast of Spain. Related to rays, skates look similar, but don't have the ray's barbed tail and are harmless to humans.





Algiers, Algeria Covered head to toe by *hijab* but still soaked to the skin, Muslim women defy the Algiers heat by splashing in the surf at the city's Kitani beach.



Decorate Your Desktop with Visions of Earth images at ngm.com/0705.

PHOTO: ZOHRA BENSEMRA, REUTERS/CORBIS



F O S S I L S



Some 1,300 dino tracks border an Army training site in Colorado.



Track Flak

U.S. soldiers someday could train where dinosaurs once trod if the Army acquires a big tract of Colorado prairie and canyonland. Last year a map was leaked to the public showing land that Fort Carson might add to its Piñon Canyon Maneuver Site. Included in the area: dozens of private ranches, part of Comanche National Grassland, and one of North America's largest concentrations of dinosaur tracks and bones.

The Army needs larger training areas to practice long-range battle techniques. A Fort Carson spokesperson said the Army would prefer not to obtain the land around the tracks, currently managed by the Forest Service, but won't rule it out. Several hurdles remain before Fort Carson could move forward, not least among them winning congressional approval. —Peter Gwin

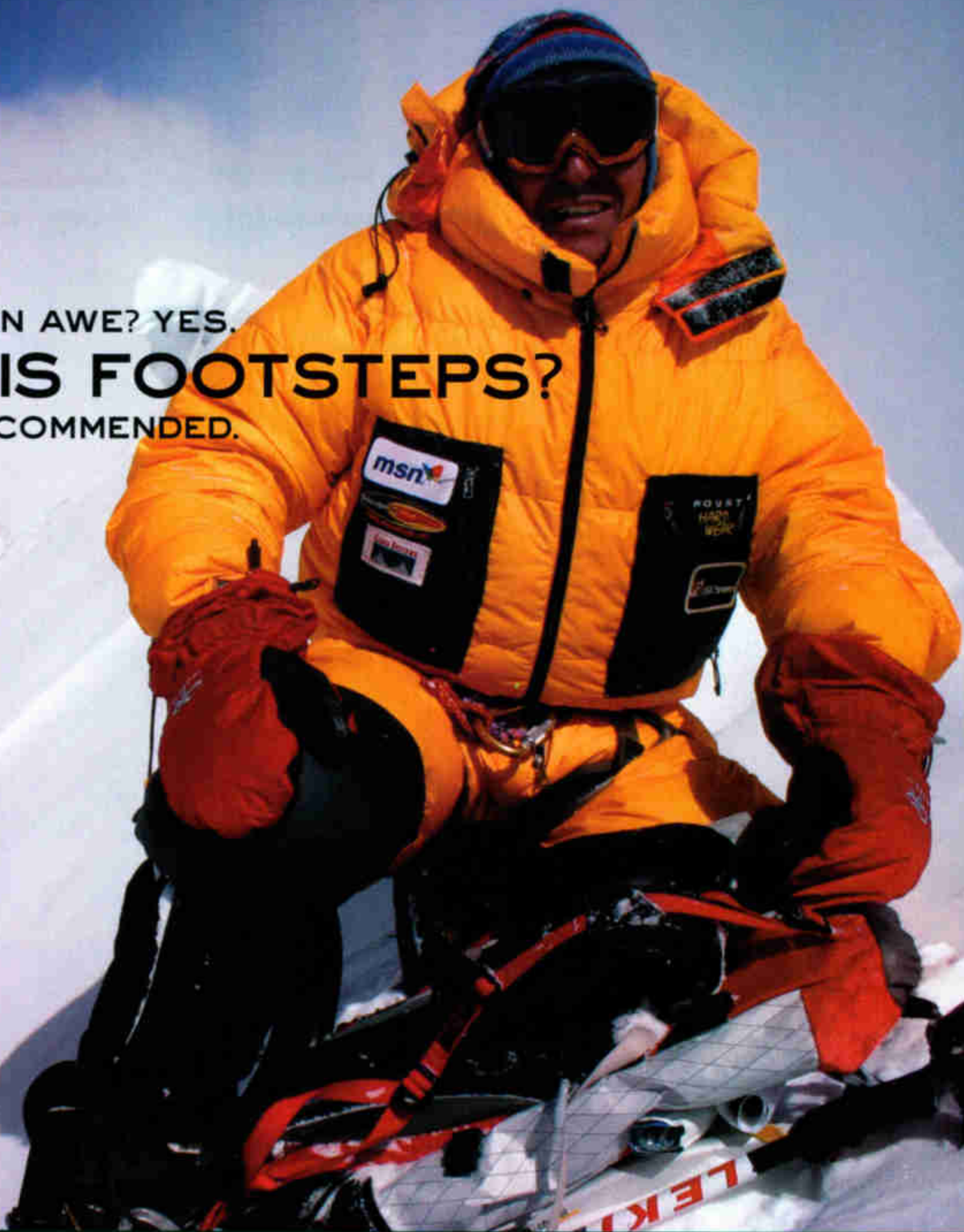
Fresh Dirt

Her size was revolutionary and evolutionary. At about five and a half feet tall and 173 pounds, the Jinniushan specimen is the largest known female ancestor of humans. Living 260,000 years ago near China's border with North Korea, she also "represents the most northern and eastern

zone of human habitation that we know of during the Pleistocene epoch," says Karen Rosenberg, one of the researchers who analyzed the fossil and reported their work in *Proceedings of the National Academy of Sciences*. In cold climates, mammals tend to evolve large, short-limbed bodies

to preserve body heat. This Stone Age female's bones reveal that same adaptive response to her climate, which was likely so cold that humans today wouldn't survive without clothing or shelter—items she may have lacked. So far, her fossil is the only human evidence of her time and place.

STAND IN AWE? YES.
FOLLOW IN HIS FOOTSTEPS?
NOT RECOMMENDED.



Ed Viesturs was hailed by National Geographic as one of the strongest high-altitude mountaineers on Earth. He has gazed from the summit of Mount Everest six times, and climbed all 14 of the world's 8,000-meter mountains, without supplemental oxygen; a feat few people will ever accomplish. There are exceptional explorers on this planet – but only one Ed Viesturs.



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NEW YORK

Hot Pod Agronomists Joy and Michael Michaud were eager to nourish the unfamiliar pepper plant they spotted at a Pakistani market an hour's drive from their home in Dorset, England. They bought it, let it grow, and were stunned when tests revealed that the bite-size chili, which they dubbed the Dorset naga (below), had a staggering amount of capsaicin—the chemical compound that causes the burn. “We fried it with the windows thrown open, and we all kept choking and coughing,” says Joy. “Oh, but the sauce was wonderful.” —*Catherine L. Barker*

NAGA SAGA

The Dorset naga, a version of Bangladesh's fiery naga morich, is one of three contenders in the race for world's hottest pepper.

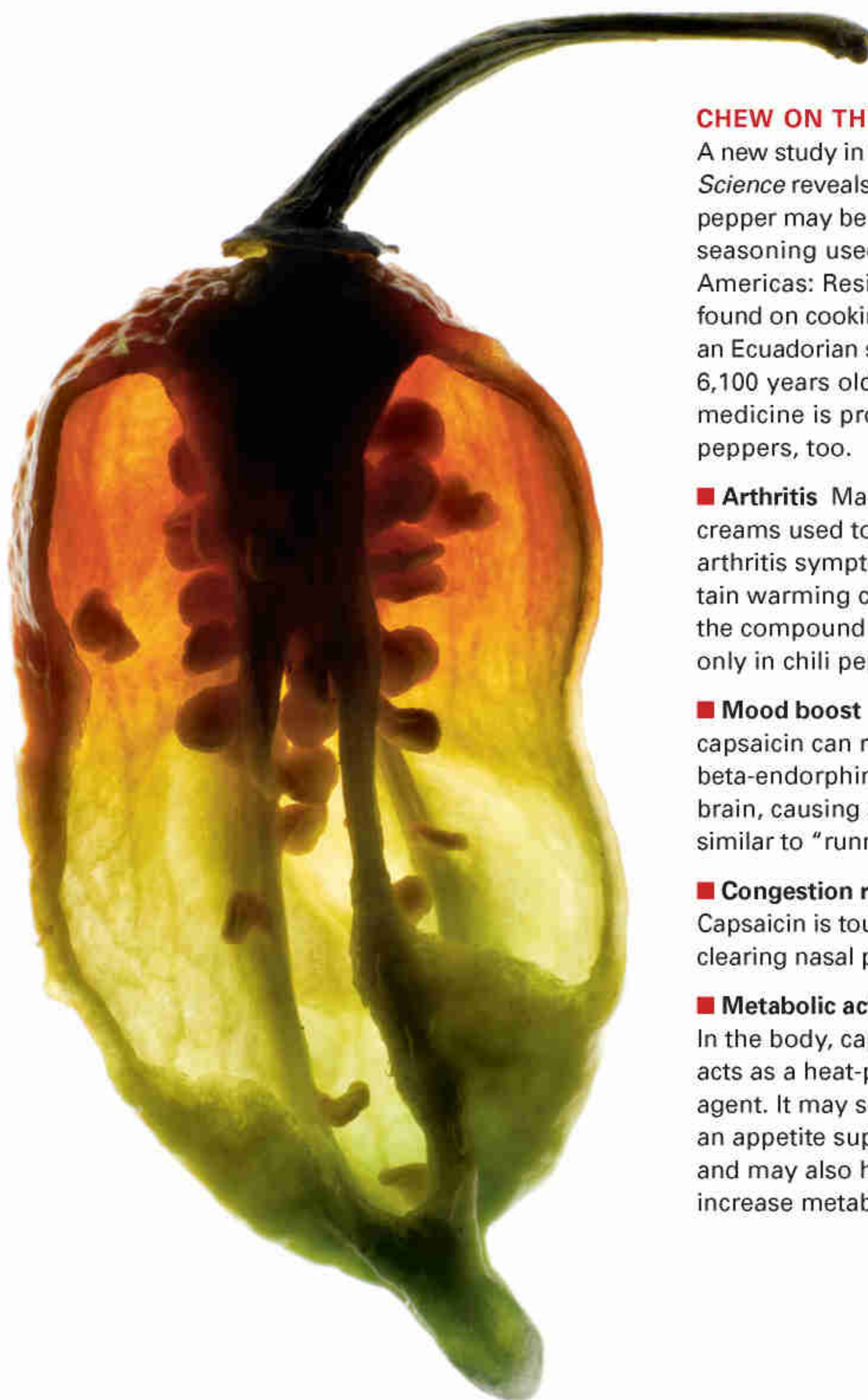
■ **Competition** All three superhot peppers are from the jolokia family (see chart). Their heat is more than three times greater than the old champ.

■ **Danger** The naga's nubby skin offers protection from the caustic capsaicin within. But its seeds and flesh will burn the hands that hold them.

■ **Flavor** The raw pepper is “too hot for us,” says Michael Michaud. “But the aroma is sweet and fruity to me.”

HEAT INDEX

Named for an American chemist, Scoville heat units (SHU) are used to rate a pepper's potential to burn. The numbers below are averages, since heat level can vary depending on the type of chili and on growing conditions.



CHEW ON THIS

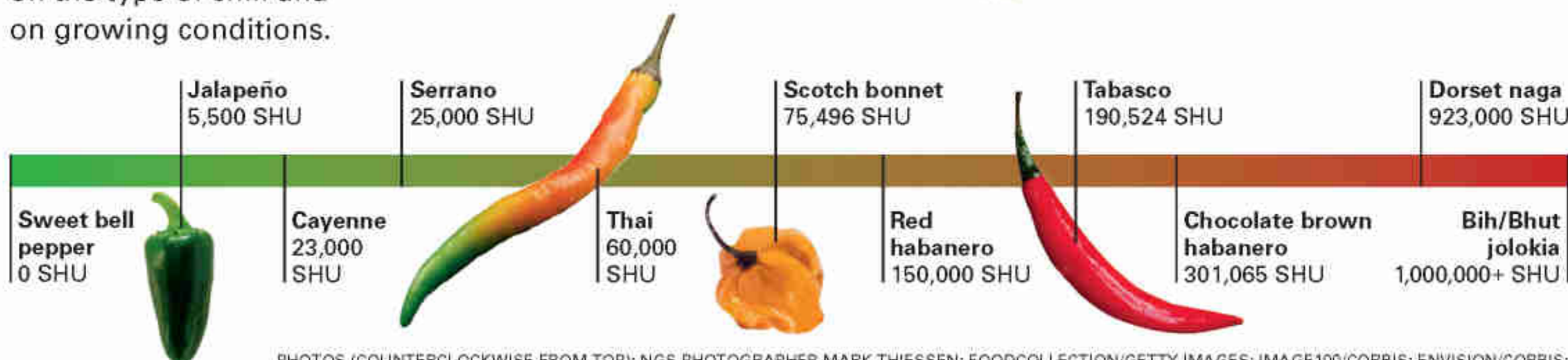
A new study in the journal *Science* reveals that chili pepper may be the oldest seasoning used in the Americas: Residue was found on cooking tools at an Ecuadorian site about 6,100 years old. Modern medicine is probing peppers, too.

■ **Arthritis** Many topical creams used to treat arthritis symptoms contain warming capsaicin, the compound found only in chili peppers.

■ **Mood boost** Eating capsaicin can release beta-endorphins in the brain, causing an effect similar to “runner's high.”

■ **Congestion relief** Capsaicin is touted for clearing nasal passages.

■ **Metabolic activity** In the body, capsaicin acts as a heat-producing agent. It may serve as an appetite suppressant and may also help increase metabolism.



PHOTOS (COUNTERCLOCKWISE FROM TOP): NGS PHOTOGRAPHER MARK THIESSEN; FOODCOLLECTION/GETTY IMAGES; IMAGE100/CORBIS; ENVISION/CORBIS; MICHELLE GARRETT, CORBIS. SOURCES: CHILI PEPPER INSTITUTE OF NEW MEXICO STATE UNIVERSITY; FRONTAL AGRITECH



**"MY ARTHRITIS
PAIN IS GONE."**

Mary Lou Retton
1984 Olympic Gold Medalist

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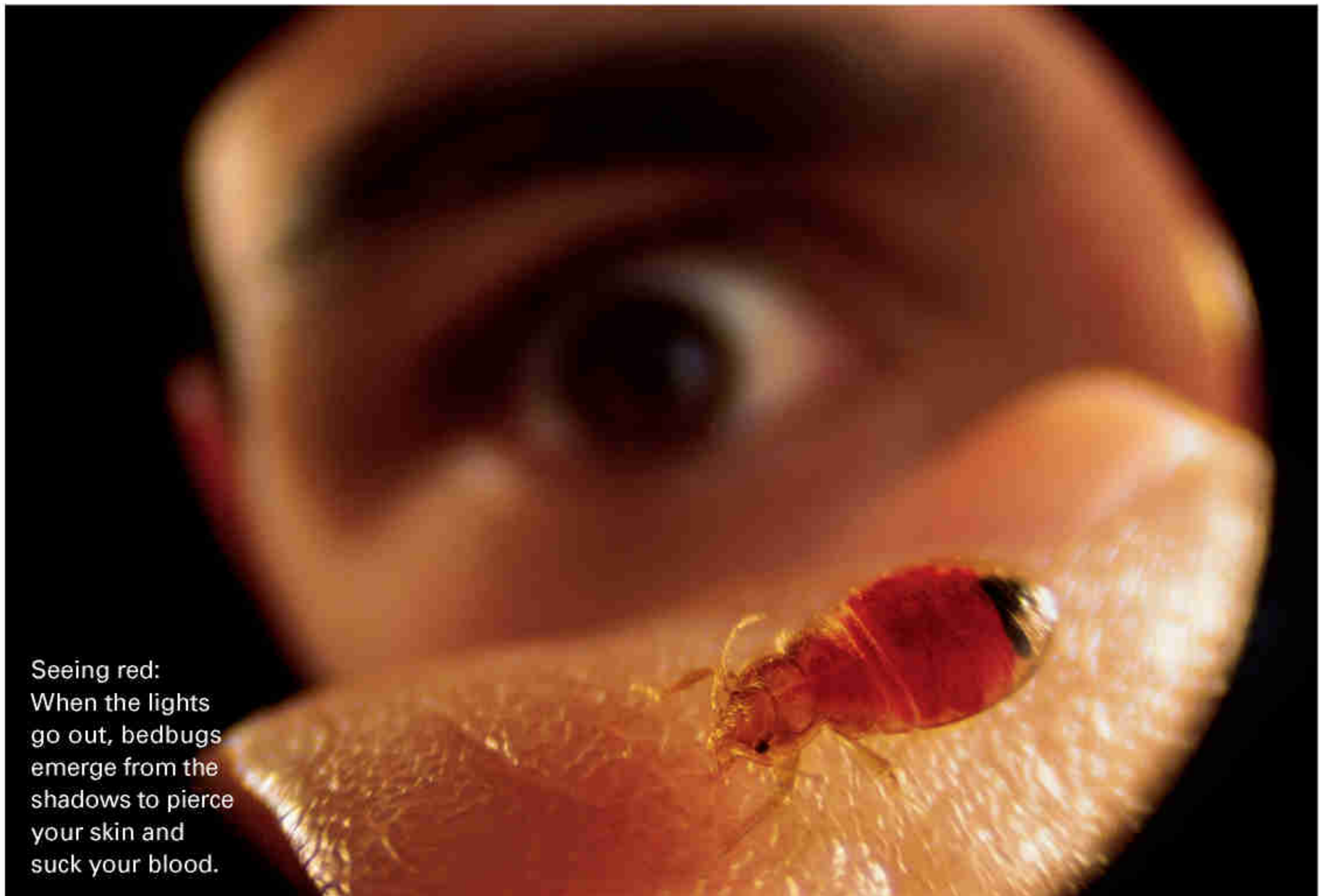
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Seeing red: When the lights go out, bedbugs emerge from the shadows to pierce your skin and suck your blood.

They're Back "Don't let the bedbugs bite" is an old-fashioned refrain, but it's timely advice: Bedbugs, which had seemingly been controlled in the U.S., are on the rise. In New York City, for instance, the housing preservation department recorded only two bedbug cases in 2002; in 2006, nearly 1,200 cases popped up. Elsewhere across the continent, these wingless pests are thriving—hiding in mattress creases and bedroom furniture, then crawling out at night to suck the blood of those who slumber, often leaving itchy skin welts behind. Why the comeback? After World War II, better household hygiene and the liberal use of pesticides helped kill most bedbugs in the United States. By the 1970s, though, many insecticides had been proved hazardous to human health, so they were used less frequently. Bedbugs also got a boost from growing



numbers of international travelers, whose luggage carried the tiny stowaways to the U.S. Fortunately, bedbugs aren't known to transmit pathogens. But these parasites can cause bugged-out people to panic. Pesticides work but, if overused, can do more harm than good. —Alan Mairson

BEDBUGS IN BRIEF

- **Scientific name**
Cimex lectularius
- **Signs of infestation**
Mattresses dappled with small dark spots, which might be bug excrement. Also look for unexplained insect bites on the skin.
- **Expert aid** A licensed pest-management professional can inspect and, if necessary, apply pesticides to infested areas.
- **Self-help** Scrub bedbug eggs off mattresses and furniture. Vacuum and caulk where bugs may hide.
- **For more information**
Go to www.hsph.harvard.edu/bedbugs. For the blogger perspective, see bedbugger.wordpress.com



Jess Jackson, Taylor Peak Estate, Bennett Valley



Understanding the *grand cru* concept allows us to make our wine taste even better. Simply stated, *grand cru* is the French concept of designating a specific single vineyard, estate or château as showing the highest potential for greatness. Factors that determine this distinction are the superior balance of well-drained soils, preponderance of thin soil, the micro-weather of that special place such as angle of light to the sun, and the level of exposure to warm temperatures and cooling moisture from coastal fog or mist.

The *grand cru* concept is the approach my family and I have adopted when selecting the land that will produce our grapes.

We have found that the mountains, ridges, hillsides and benchlands along California's cool coastal region possess the ideal terroir to deliver world-class grapes with rich, intense and complex flavors. This is where you will find our Jackson Estates Grown Vineyards. We select the finest grapes from our best estate vineyards and blend them to make our highly celebrated Vintner's Reserve. In other words, the ultimate blending of *grand cru*. Because we believe you can taste the difference.

It is my understanding that many of you enjoy the taste of our wines but aren't sure why. Hopefully, I can help with the facts and **A Taste of the Truth.**

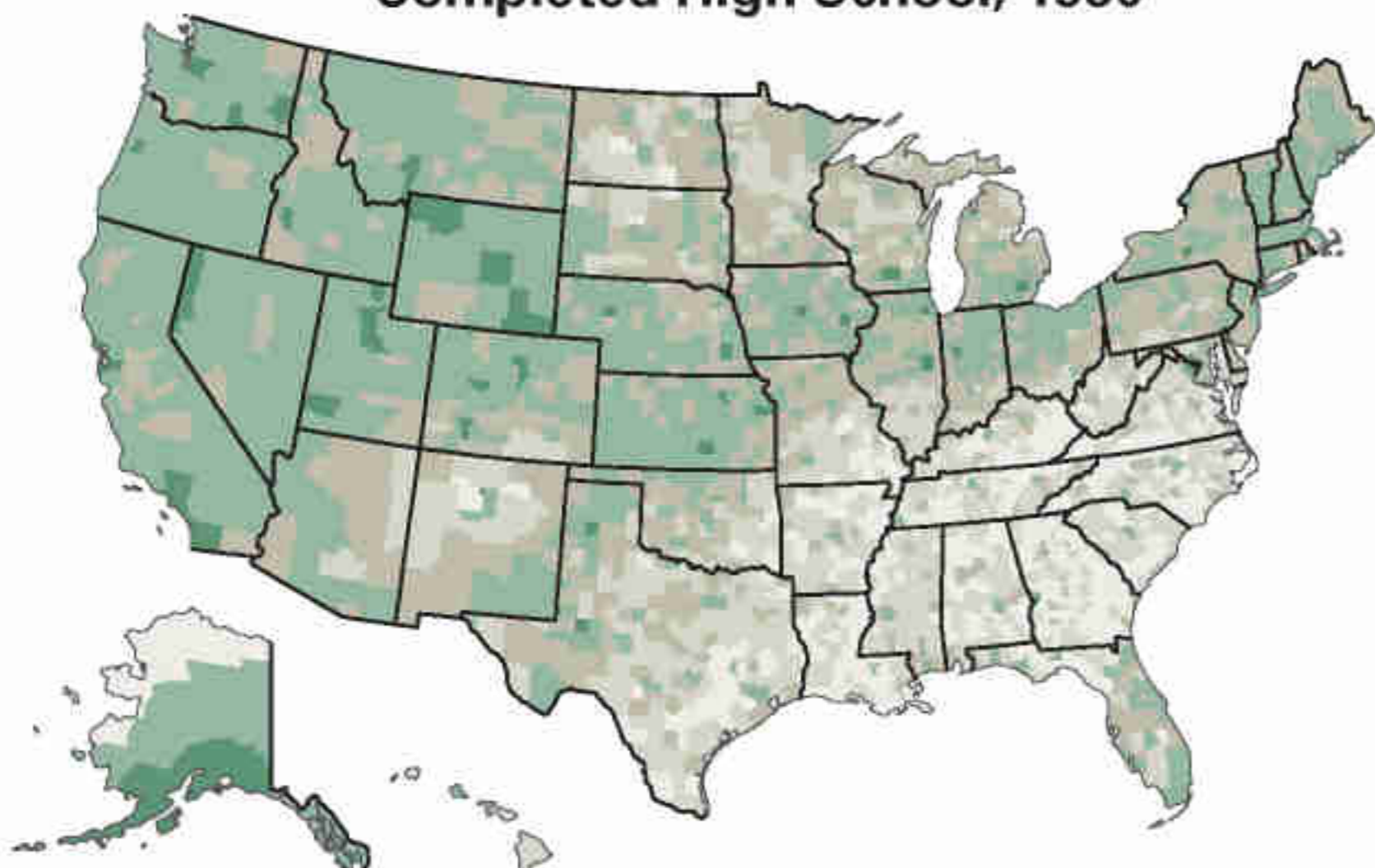
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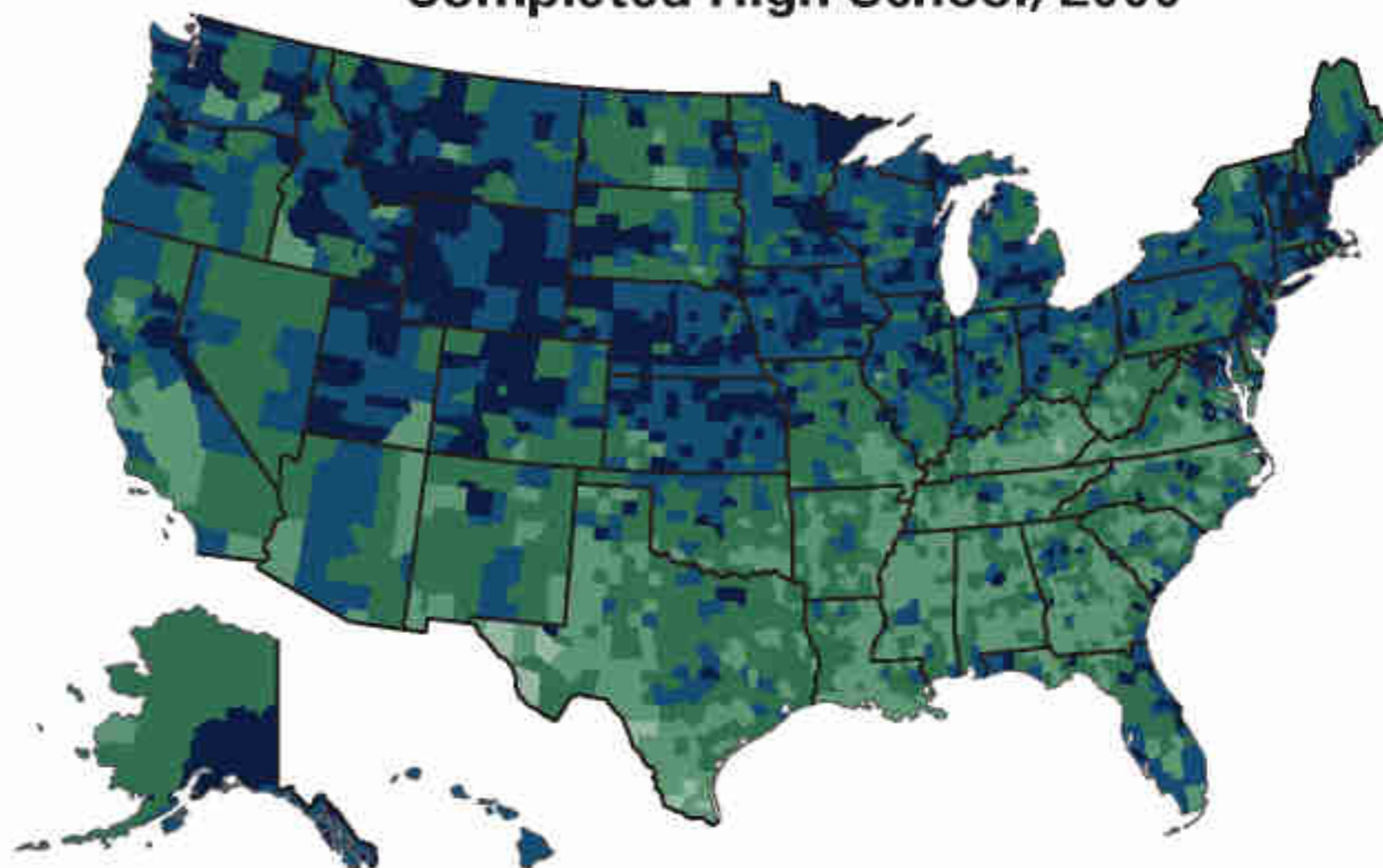


Graduation Nation Battling to be the best and brightest, Americans are spending more time than ever going to class. Graduation levels are at an all-time high. Among adults age 25 and over, 85 percent have at least a high school diploma, and college completion rates have tripled from 9.1 percent in 1964 to 27.7 percent in 2005. Women and people of color are driving the trend. At the high school level, the gap in education between southern states and the rest of the U.S. is narrowing. Starting early appears key: In 1967, just 1 in 7 of the country's three- and four-year-olds went to school; from 1997 on, more than half have been enrolled each year. —Jennifer S. Holland

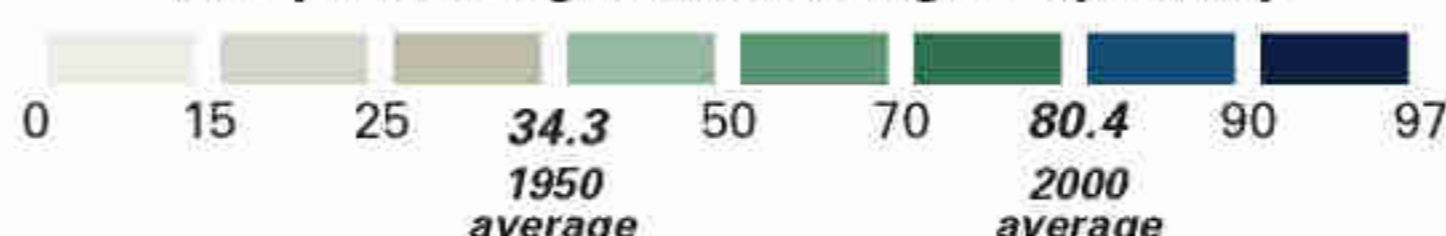
Completed High School, 1950



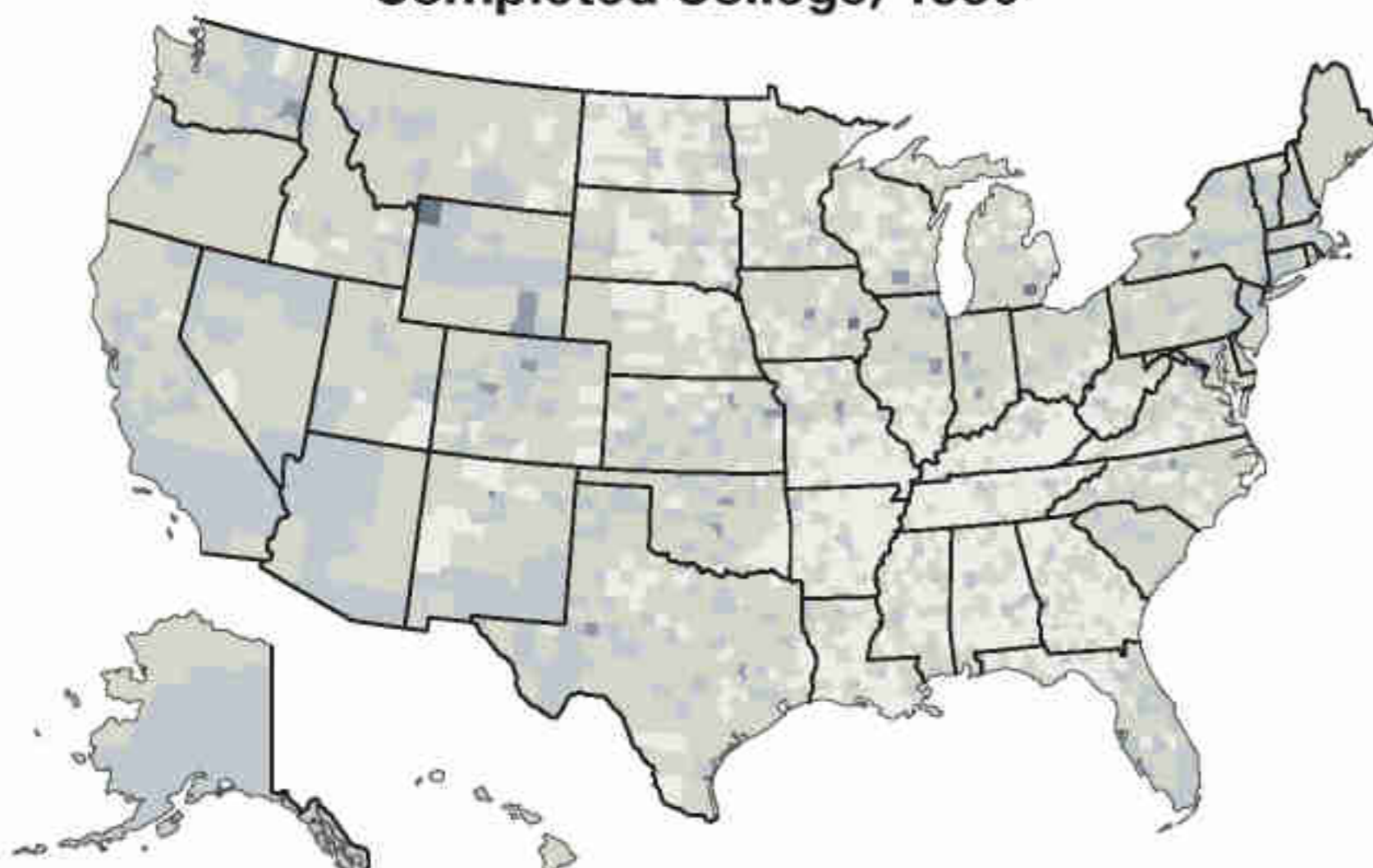
Completed High School, 2000



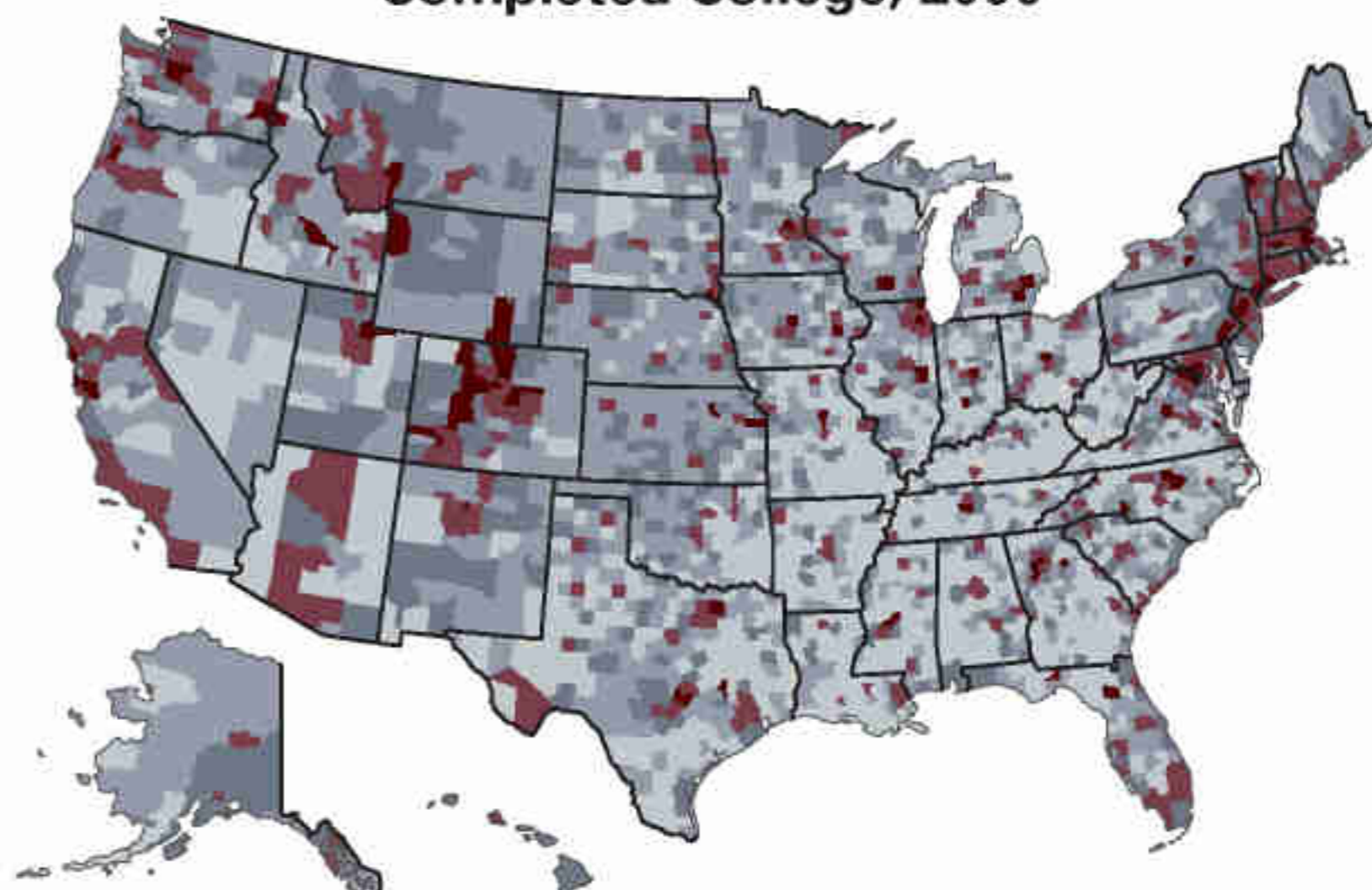
Percentage of population 25 and older with four years of high school or higher by county



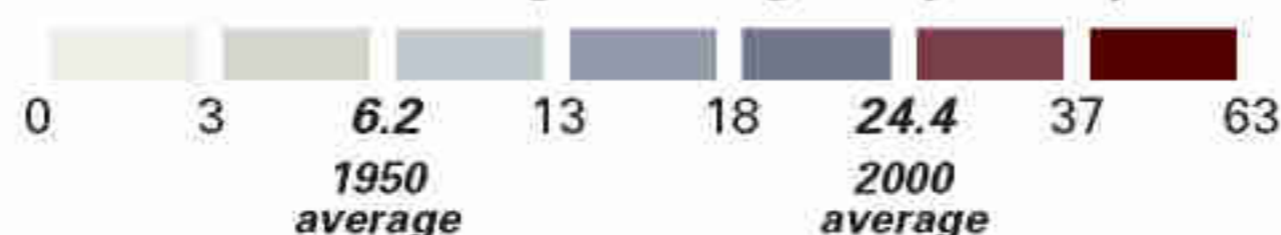
Completed College, 1950



Completed College, 2000



Percentage of population 25 and older with a bachelor's degree or higher by county



AFRICA
ALASKA
ASIA & PACIFIC
AUSTRALIA
NEW ZEALAND
CANADA
NEW ENGLAND
CARIBBEAN
EUROPE
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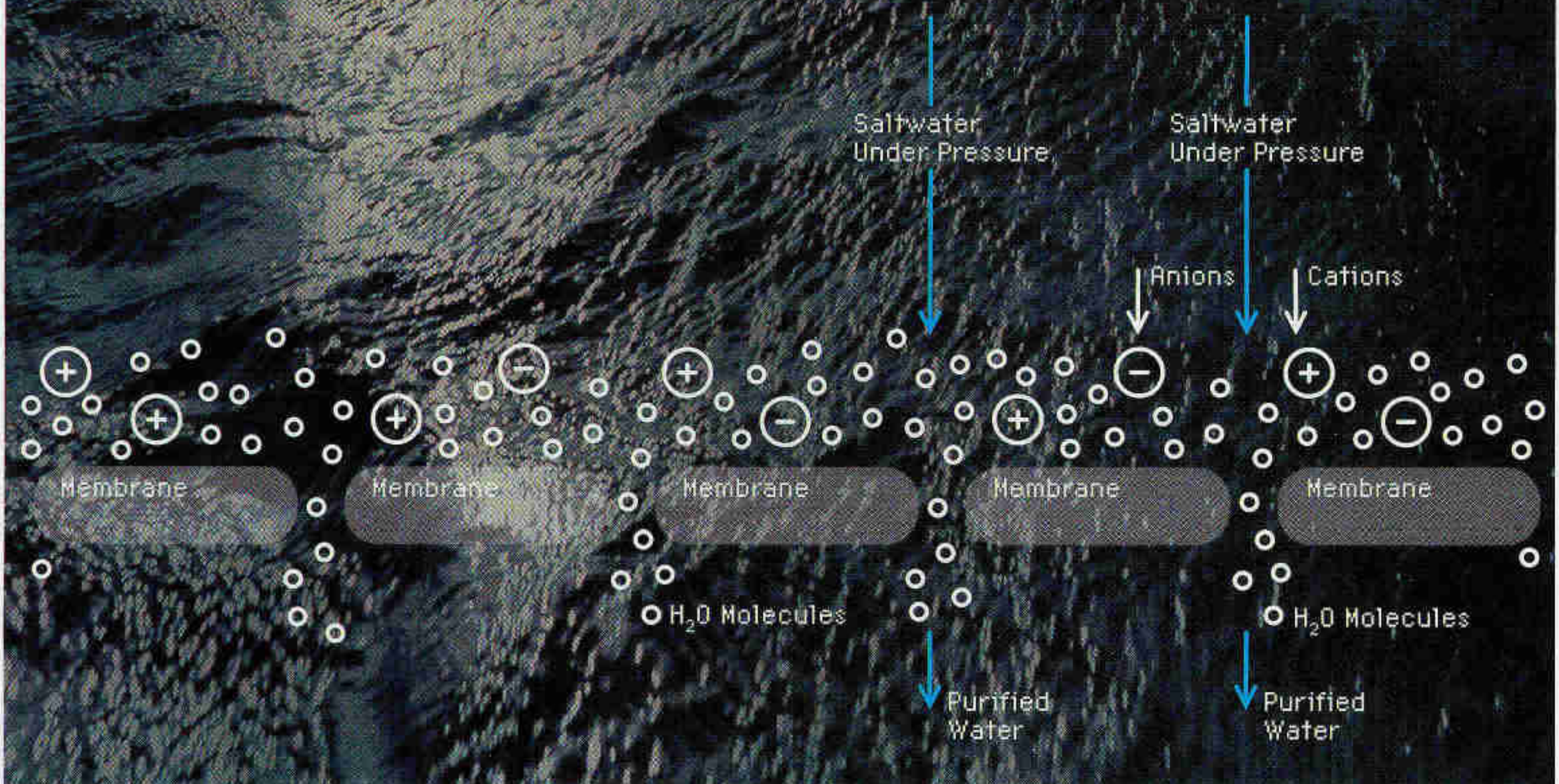
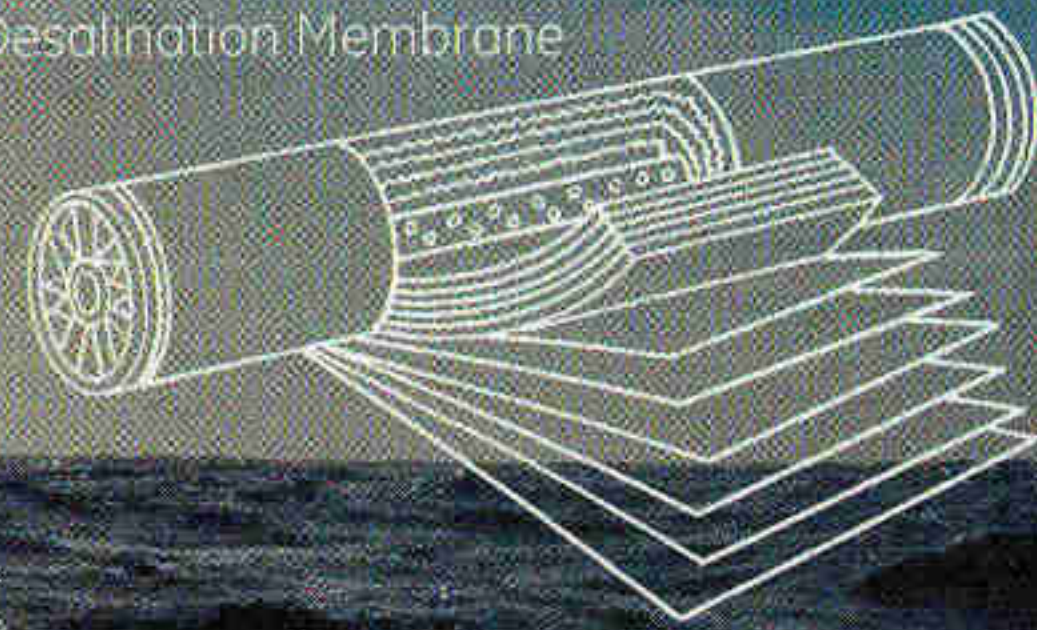
Moso bamboo, used to make fabrics, can reach a mature height of 75 feet within two months.

Bamboo Steps Up With more than a thousand known species and countless uses from panda food to flooring, bamboo is now spreading to textiles. A process similar to what transforms wood pulp into rayon turns tough stems into a silky fabric that's highly absorbent and antibacterial. Specialty boutiques and even some national chains now offer bamboo-based clothing and linens. Consumers like the fact that these products come from a renewable plant that thrives without many added chemicals. In 2004, China—the biggest bamboo producer—exported about a million dollars' worth of bamboo for textile manufacture. By 2006, that amount had grown tenfold. If trends continue, this upstart fabric may someday compete with King Cotton. —A. R. Williams

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WHERE IN THE WORLD?



Sand dunes surround Jebel Arkenu, a rocky outcrop in Libya that is also a seasonal oasis.

Sand and Stone It's a thousand-mile trek from the shores of Tripoli to Jebel Arkenu, a ten-mile-wide swirl of granite in the Libyan desert. The overlapping circular ridges probably formed when underground chambers of magma forced the surface to surge and subside. Zoom out from this satellite shot, and similar black smudges pop up all over the Sahara. Seen wide from the sky, North Africa's arid expanse doesn't really resemble the iconic image of the Sahara as an endless sea of sand. It's a much rockier world. —*Alan Mairson*



Peruvian archaeologist Sonia Guillén (above) believes this canine mummy could be related to her pet (below, in a cemetery where dogs were buried).



Heir of the Dog

When archaeologist Sonia Guillén went searching for the reason that ancient Peruvians buried their dogs with blankets and food, she was guided by her own hound. Guillén had discovered 83 dogs laid to rest with textiles and meals (fish, abalone, and llama meat) in thousand-year-old cemeteries of the Chiribaya culture. Forty-three of the dogs, excavated near the southern port of Ilo, had been mummified by the region's arid climate and salty soil. They resembled Guillén's pet Abdul—a stray that, like many mongrels in Peru, has the light-colored fur and the features of a golden retriever. An anatomist verified the similarity in bone structure. A geneticist is testing the ancient dog DNA to establish a further link with modern dogs in Peru. As for the mystery of the deluxe burial, Guillén found a clue in the way Abdul circled her during walks. The Chiribaya kept a now extinct variety of llamas and wove exquisite textiles from their long, fine hair. Guillén believes that the dogs might once have been used throughout Peru to herd the prized llamas. The canines were buried with honor, she believes, to thank them for serving as "Chiribaya shepherds." —Karen E. Lange



America, Found & Lost

By Charles C. Mann



Much of what we learned in grade school about the New World encountered by the colonists at Jamestown is wrong. Four hundred years later, historians are piecing together the real story.

When English settlers brought West Indian tobacco (right) and European livestock such as pigs to 17th-century Virginia, they triggered changes that would bring an end to an ecosystem—and create a new one in its place.



I T IS JUST POSSIBLE that John Rolfe was responsible for the worms—specifically the common night crawler and the red marsh worm, creatures that did not exist in the Americas before Columbus. Rolfe was a colonist in Jamestown, Virginia, the first successful English colony in North America. Most people know him today, if they know him at all, as the man who married Pocahontas. A few history buffs understand that Rolfe was one of the primary forces behind Jamestown’s eventual success. The worms

hint at a third, still more important role: Rolfe inadvertently helped unleash a convulsive and permanent change in the American landscape.

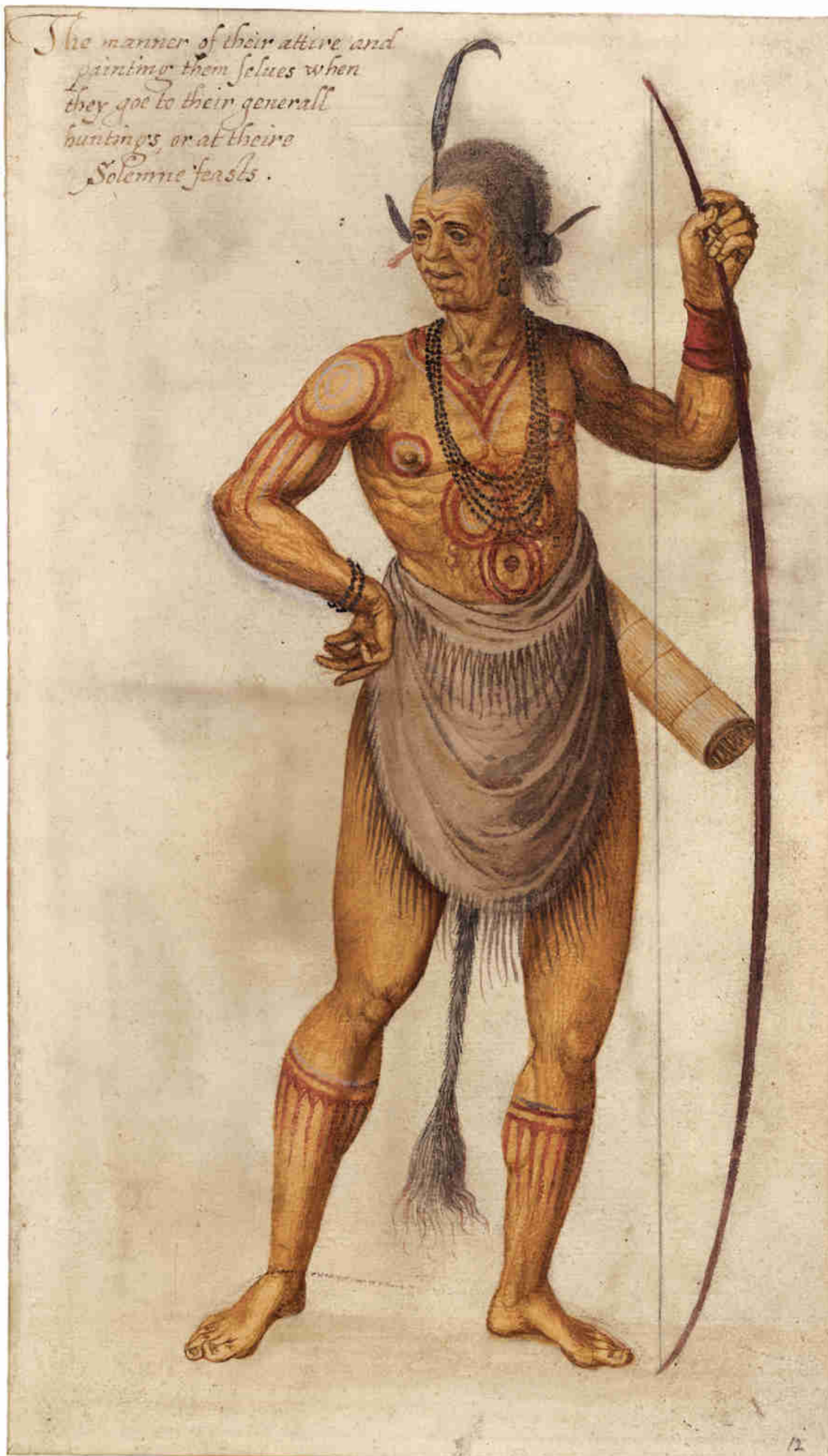
Like many young English blades, Rolfe smoked—or, as the phrase went in those days, “drank”—tobacco, a fad since the Spanish had first carried back samples of *Nicotiana tabacum* from the Caribbean. Indians in Virginia also drank tobacco, but it was a different species, *Nicotiana rustica*. Virginia leaf was awful stuff, wrote colonist William Strachey: “poor and weak and of a biting taste.” After arriving in Jamestown in 1610, Rolfe talked a shipmaster into bringing him *N. tabacum* seeds from Trinidad and Venezuela. Six years later Rolfe returned to England with his wife, Pocahontas, and the first major shipment of his tobacco. “Pleasant, sweet, and strong,” as Rolfe’s friend Ralph Hamor described it, Jamestown’s tobacco was a hit. By 1620 the colony exported up to 50,000 pounds of it—and at least six times more a decade later. Ships bellied up to Jamestown and loaded up with barrels of tobacco leaves. To balance the weight, sailors dumped out ballast, mostly stones and soil. That dirt

almost certainly contained English earthworms.

And little worms can trigger big changes. The hardwood forests of New England and the upper Midwest, for instance, have no native earthworms—they were apparently wiped out in the last Ice Age. In such worm-free woodlands, leaf litter piles up in drifts on the forest floor. But when earthworms are introduced, they can do away with the litter in a few months. The problem is that northern trees and shrubs beneath the forest canopy depend on that litter for food. Without it, water leaches away nutrients formerly stored in the litter. The forest becomes more open and dry, losing much of its understory, including tree seedlings.

Whether the night crawler and the red marsh

A coastal Indian depicted in 1585 by voyager and artist John White resembles the Powhatan hunters the English encountered at Jamestown in 1607. Though the region appeared sparsely inhabited to the settlers, more than 15,000 Indians were using nearly every square foot to farm, hunt, fish, and gather.





TRUSTEES OF THE BRITISH MUSEUM

worm actually first arrived on Rolfe's tobacco ships is not known. What is clear is that much of the northern forests in America were worm free until the Europeans arrived there, inadvertently importing earthworms on the root-balls of their plants or in the ballast of ships. The effects of this earthworm invasion have been slow to show themselves because the creatures don't spread rapidly on their own. "If they're born in your backyard, they'll stay inside the fence their whole lives," says John Reynolds, editor of *Megadrillogica*, the premier earthworm journal. But over time, the effect on the ecosystem can be dramatic.

Jamestown is known for inaugurating the great American struggles over democracy (the colony established English America's first representative government) and slavery (it was the first English colony to use captured Africans). Rolfe's worms, as one might call them, point to another part of its history. The colonists did not come to the Americas alone. Instead they were accompanied by a great parade of insects, plants, mammals, and microorganisms. Some of the effects were almost invisible; others were enormous. Together with the newcomers' different ways of managing the land, these creatures literally changed the ground beneath the Indians' feet. Setting up camp on marshy Jamestown peninsula, the colonists were taking the first steps toward creating the American landscape we know today.

TWO HUNDRED AND FIFTY MILLION years ago the world contained a single landmass known to scientists as Pangaea. Geologic forces broke this vast expanse into pieces, sundering Eurasia and the Americas. Over time the two halves

Eyewitness to a way of life that soon would vanish, John White painted gardens of corn, their staple crop, among houses in a sprawling Indian village. All along the East Coast, Indians cleared plots with stone tools and planted with digging sticks. The English would bring metal axes and—later—plows.

of the world developed wildly different suites of plants and animals. Columbus's signal accomplishment was, in the phrase of historian Alfred Crosby, to reknit the torn seams of Pangaea. After 1492, the world's ecosystems collided and mixed as European vessels carried thousands of species to new homes across the oceans. The Columbian exchange, as Crosby called it, is why there are tomatoes in Italy, oranges in Florida, chocolates in Switzerland, and hot peppers in Thailand. It is arguably the most important event in the history of life since the death of the dinosaurs.

For English America, Jamestown was the opening salvo in the Columbian exchange. In biological terms, it marked the point when *before* turns into *after*. And it began 400 years ago this month, on May 14, 1607, when 104 colonists disembarked on Jamestown peninsula, on the southern fringe of Chesapeake Bay.

Much of what we learned in grade school about the New World encountered by the colonists at Jamestown turns out to be wrong. In movies and textbooks the colonists are often depicted as arriving in a pristine forest of ancient trees, small bands of Indians gliding, silent as ghosts, beneath the canopy. But the idea that the English were "settlers" of land that was unsettled before they arrived is complete nonsense. In fact, three English ships landed in the middle of a small but rapidly expanding Indian empire called Tsenacomoco.

Three decades before, Tsenacomoco had been a collection of six separate chiefdoms. By the time the foreigners came from overseas, its paramount chief, Powhatan, had tripled its size to about 8,000 square miles and more than 14,000 people. Wary, politically shrewd, ruthless when needed, Powhatan was probably in his 60s when the English landed—a "goodly old man, not yet shrinking" with age, according to colonist Strachey, "well beaten with many cold and stormy winters," but still "of a tall stature and clean limbs." His sphere of influence stretched from the Potomac to Cape Henry (see map, page 49).

Most of Powhatan's people (known by the

Europeans imported
earthworms on the
root-balls of plants or in
the ballast of ships.
Little worms can trigger
big changes.



NIGHT CRAWLERS, *Lumbricus terrestris*

colonists as the Powhatan Indians) lived in villages of a few hundred inhabitants surrounded by large tracts of cleared land: cornfields and former cornfields. Except for defensive palisades, the landscape was unfenced. By a quirk of evolutionary history, North America had, except for dogs, no large domesticable mammals; its native species, such as bison and deer, could not be tamed. With no horses, cattle, sheep, goats, or chickens to tend, villagers had no need to enclose their fields.

Between the villages was the forest, splendid with chestnut and elm but hardly untouched. "It was touched, and sometimes heavily," says Donald Young, an ecologist at Virginia Commonwealth University in Richmond. In the fall, Indians burned the underbrush, keeping the forest so open and parklike, colonist John Smith wrote, that "a man may gallop a horse amongst these woods." With Indian villages dotting the region's many riverbanks, the Chesapeake Bay was a jumble of farm fields, marshes, deep forest, and secondary forest (young trees growing on abandoned plots). Jamestown peninsula was an example of the last; it had been cleared,

perhaps for farm fields, a generation or two before the English arrived.

The new colony was a private enterprise funded by a group of venture capitalists called the Virginia Company. Much like investors in today's dot-com start-ups, the backers wanted a quick return. They believed, incorrectly, that the Chesapeake Bay region was laden, like Mexico and Peru, with vast stores of gold and silver. The goal was to acquire these precious metals as expeditiously as possible. Spain, too, believed that gold and silver could be found there. It had long ago claimed what is now the U.S. East Coast for itself and in 1570 had planted a mission a few miles north of Jamestown.

The local Indians wiped out that mission. English colonists who settled on Roanoke Island 110 miles south of Jamestown in the 1580s may also have met their end at the hands of a native group—very possibly the Powhatan. Nonetheless the Virginia Company directors worried more about protecting their investment from distant Spain than from the Indians. They instructed the colonists—their employees, in today's terms—to settle far from the ocean, "a hundred miles from the river's mouth," which would minimize the chance of sudden assault by Spanish ships. And they told them to make sure the settlement was close to a deepwater anchorage, so they could lay up "provisions with ease." In all they did, the directors warned, the colonists should act with "great care not to offend the naturals [Indians]."

Jamestown was the result. Not wanting to antagonize Powhatan, the newcomers—*tassantassas* (strangers), as the Indians called them—looked for uninhabited ground. Because native villages occupied all the good land upriver, the colonists ended up picking a site about 35 miles from the mouth of the James. It was a peninsula near a bend in the river, at a place where the current cut a deep channel so close to the shore that oceangoing ships could be moored to the trees.

Alas, there was a reason no Indians lived at Jamestown: It was not a good place to live. The English were like the last people moving into a

subdivision—they ended up with the least desirable property. Their chosen site was marshy, mosquito-ridden, and without fresh water. Buckets could be dipped into the James, of course, but the water was potable only part of the year. During the summer, the river falls as much as 15 feet. No longer pushed back by a big flow of fresh water, the salty water of the estuary spreads upstream, stopping right around Jamestown. Worse, sediments and organic wastes from the head of the river get trapped at the saltwater boundary. The colonists were drinking some of the dirtiest water in the James—“full of slime and filth,” complained Jamestown president George Percy.

By the end of September, nearly half of the original 104 colonists had died. Percy attributed most of the deaths to “mere famine,” but he was wrong, in the view of the late historical geographer Carville Earle. The river teemed with fish in the summer—especially big, meaty Atlantic sturgeon—and the English caught and ate them. (Archaeologists at Jamestown have uncovered remains from a sturgeon as long as 14 feet.) Instead, Earle argued, the colonists were killed by “typhoid, dysentery, and perhaps salt poisoning.” All are associated with contaminated water. During winter the water would have cleared, but not in time to help the tassantassas. Many had been too sick that summer to tend the company gardens. Initially the strangers hoped to trade with the Indians for food while they spent their days hunting for gold, but the region was deep into a multiyear drought, and the Indians did not want to part with what little food they had. By January, only 38 colonists were alive—barely.

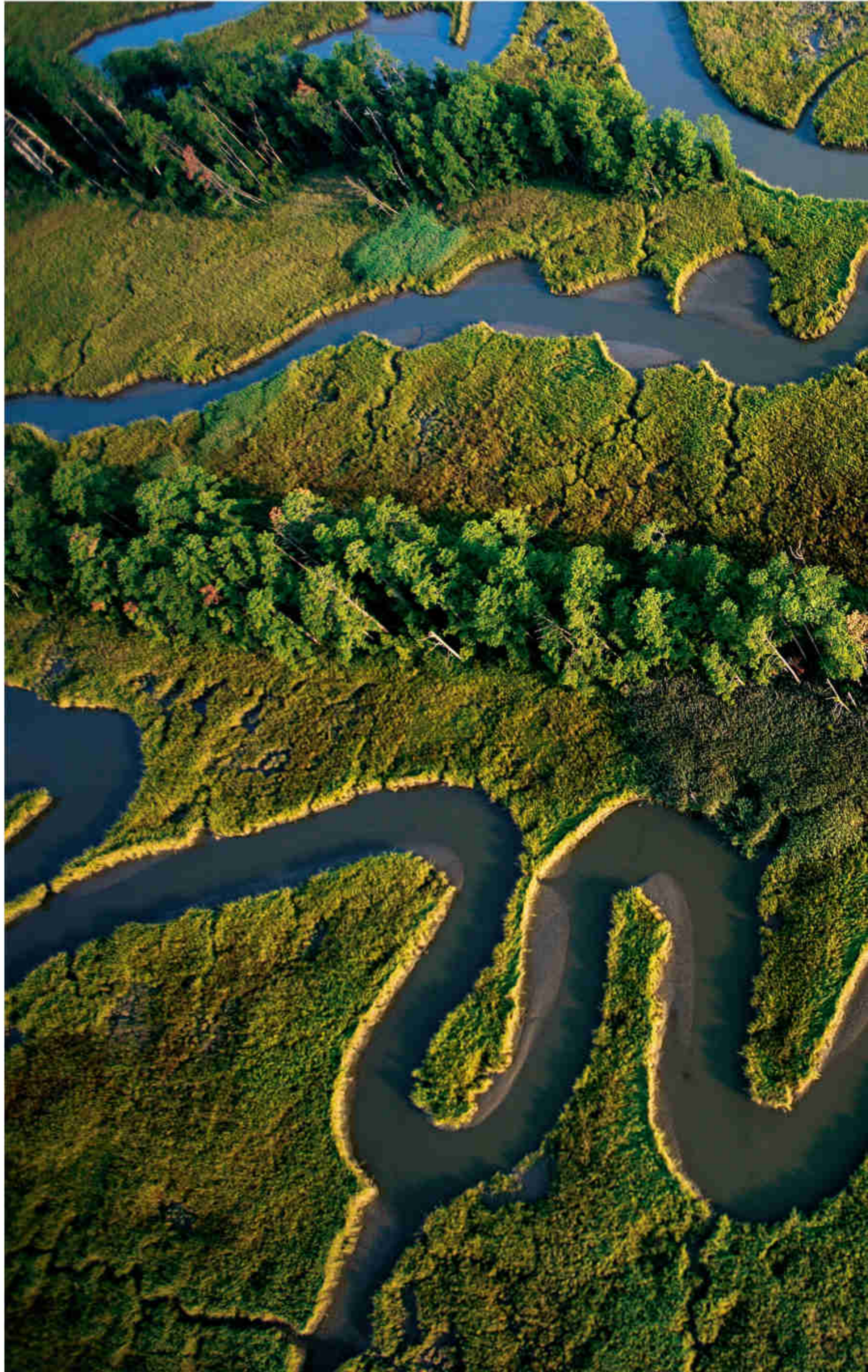
Within months, John Smith took charge of Jamestown. His wily, sometimes brutal diplomacy allowed the foreigners to extract enough food from Tsenacomoco villages to survive the next winter. This was quite a feat—with the arrival of two more convoys, the number of mouths at Jamestown had risen, even with all the deaths, to about 200. Despite his successes, Smith, a yeoman’s son, managed constantly to irritate his social betters in the Virginia Company’s

leadership. Worse for the colony, he left for medical treatment in England in the fall of 1609. He had suffered terrible burns when a bag of gunpowder he had fastened around his waist accidentally ignited. In his absence, things deteriorated. That winter, the death toll again was high.

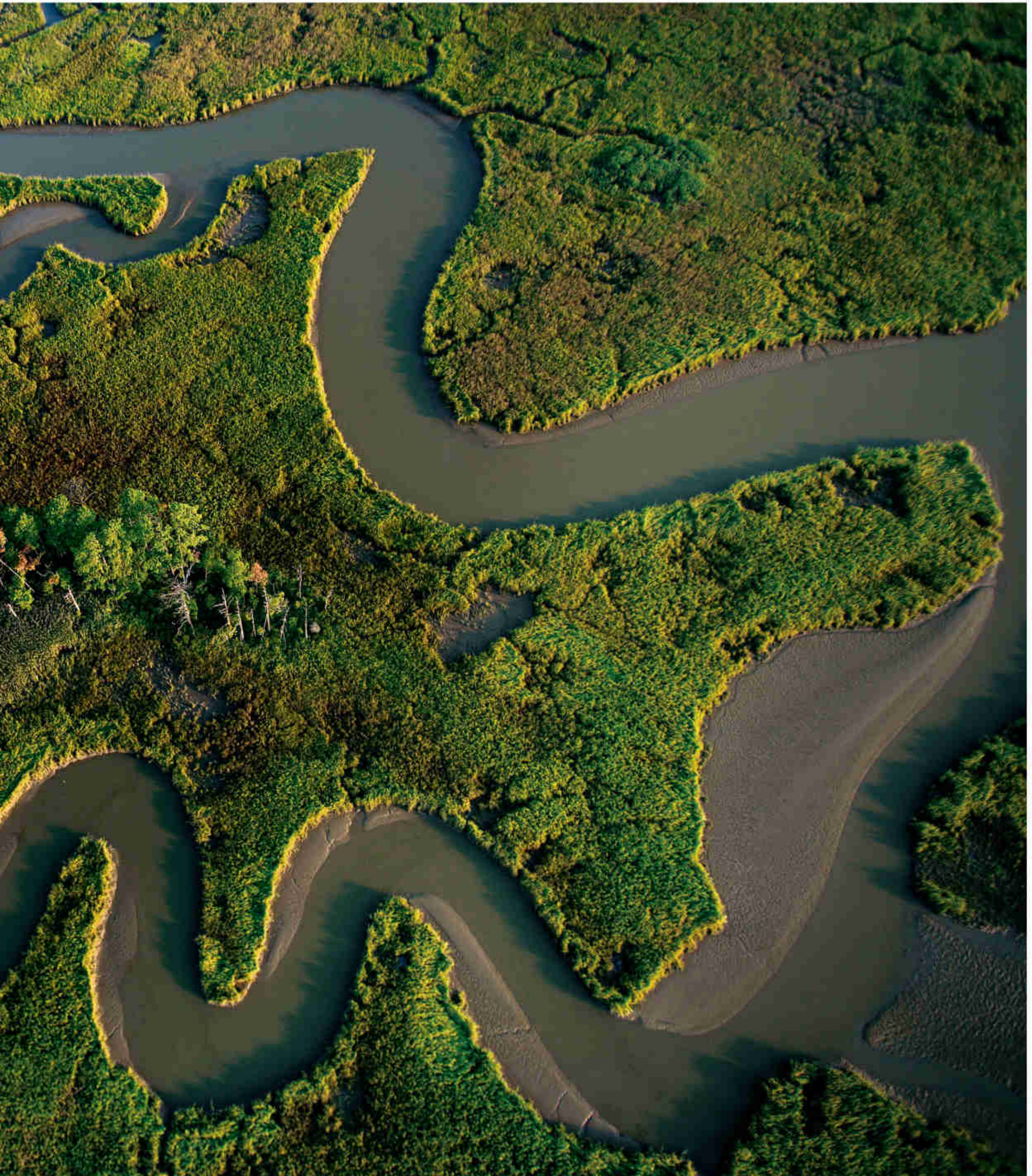
Although Jamestown was nearly defenseless, Powhatan didn’t attack. For the first year or two of the colony’s existence, he seems to have decided that the foreigners’ trade goods—guns, axes, glass beads, and copper sheets, which the Indians prized much the way Europeans prized gold ingots—were worth giving up some not-very-valuable real estate. In addition, Powhatan was probably convinced that the tassantassas would die off without his assistance, suggests Helen Rountree, an emerita anthropologist at Old Dominion University, in Norfolk, and the most prominent historian of Tsenacomoco. He could sit back and wait; the invasion from abroad would end itself.

Things would get ugly before Powhatan was proved wrong. By the beginning of 1610, the settlers at Jamestown were dining on “dogs, cats, rats, and mice,” Percy wrote, as well as the starch for their Elizabethan ruffs, which could be cooked into a kind of porridge. With famine “ghastly and pale in every face,” some colonists stirred themselves to “dig up dead corpse[s] out of graves and to eat them.” One man murdered his pregnant wife and “salted her for his food.” When John Rolfe arrived that spring, only about 60 people at Jamestown had survived what was called “the starving time.”

Rolfe himself barely made it to Virginia. Almost a year before—June 1609—nine ships had left England, carrying 500 new colonists, Rolfe among them. Not far from landfall, a hurricane slammed into the expedition. Rolfe’s vessel twisted so much in the waves that the caulking popped from its seams. For three straight days every man aboard, many “stripped naked as men in galleys,” worked pumps and bucket chains. The voyagers were near collapse when the ship ran aground on an unpeopled island in the Bermudas. For nine months, Rolfe and the



Though swampy, Jamestown peninsula attracted the English because it had been cleared before—



GEORGE STEINMETZ

Indians had downed old-growth forest, leaving settlers with smaller trees, such as these bald cypresses.

2
Coppauseo. The Stur



Virginia's tidal rivers and shallow bays were thick with meaty sturgeon, which fed English colonists

argeen. Some 10. 11. 12, or 13 foote in length.

L. B. 5. (123)



TRUSTEES OF THE BRITISH MUSEUM

and Indians alike. Overfishing in the late 1800s would leave the species nearly extinct.

Without the European
honeybee, Georgia
wouldn't have become
the Peach State;
Johnny Appleseed's trees
might not have borne fruit.



HONEYBEE, *Apis mellifera*

other survivors recovered on the island, catching fish, wild hogs, and sea turtles and assembling two small boats from the wreckage of their ship. They staggered into Jamestown on May 24, 1610, a year after leaving London.

Appalled by what they found and with limited supplies, Rolfe's group quickly decided to abandon Jamestown. They loaded the skeleton-like survivors into boats, intending to set off for Newfoundland, where they would beg a ride home from fishing vessels that plied the Grand Banks. As they waited for the tide to turn for their departure, they saw three ships approaching. It was yet *another* convoy, this one amply supplied and containing a replacement governor and 150 more colonists. The old colonists, despondent, returned to the task of figuring out how to survive.

It wasn't easy. At least 6,000 people came to Virginia from England between 1607 and 1624. More than three out of four died.

The central mystery of Jamestown is why the badly led, often starving colonists were eventually able to prevail over the bigger, better-organized forces of the Powhatan empire. In other parts of the Americas, colonizers had their

way smoothed for them, so to speak, because they landed in places that already had been devastated by Eurasian illnesses like smallpox, measles, and typhoid—diseases that had not existed in the Americas. When the Pilgrims came to Massachusetts in 1620, for instance, they established Plymouth village literally on top of an Indian village that had been emptied two years before by an epidemic (apparently spread by survivors of a French vessel that shipwrecked on Cape Cod). In Virginia, despite previous contact with Europeans, the Powhatan had somehow avoided any epidemics and were going strong when the Jamestown colonists arrived. Yet by the late 17th century, the Powhatan too had lost control of their land. What happened?

One answer emerging points to what historian Alfred Crosby calls "ecological imperialism." The tassantassas replaced or degraded so much of the native ecosystem that they made it harder and harder for the Indians to survive in their native lands. As the colonists bitterly came to realize that Virginia had no gold and that the Indians weren't going to selflessly provide them with all the food they needed, they began to mold the land to their needs. Unable to adapt to this foreign landscape, they transformed it into a place they could understand. In doing so, they unleashed what would become a multilevel ecological assault on North America. Their unlikely weapons in this initial phase of the campaign: tobacco, honeybees, and domestic animals.

MOST HISTORIANS think it unlikely that Pocahontas saved John Smith's life. Smith was sent off to explore the headwaters of the Chickahominy River in December 1607, in a canoe with two English companions and two Indian guides. One hope was that the river might be the entrance to the long-rumored passage between the Atlantic and Pacific Oceans. The expedition was intercepted by a force led by Opechancanough, Powhatan's powerful brother.

Opechancanough brought his captive to Powhatan, who lived on the north bank of the York River. In Smith's telling, the leader decided

to execute him after a public feast. Executioners “being ready with their clubs to beat out his brains, Pocahontas, the king’s dearest daughter,” then perhaps 11 years old, suddenly rushed out and cradled Smith’s head in her arms “to save him from death.” Fondly indulging his daughter’s crush, Powhatan commuted Smith’s sentence and returned him to Jamestown with food.

Historians don’t buy this account, published in 1624, not least because Smith also described his capture a few months after it happened, in a report not intended for publication, and said nothing about being saved by an Indian maiden. Overall, the two versions of Smith’s Virginia adventures are similar, except the one intended for the bookstores presents the events with a melodramatic flourish. Being saved from death by a lady’s intervention was a favorite motif in Smith’s tales. True or not, the story of Smith’s rescue has overshadowed a more important bit of history: Pocahontas actually did help save the colony—by marrying John Rolfe six years later.

Evidence suggests Pocahontas was a bright, curious, mischievous girl, one who, like all girls in Tsenacomoco, went without clothing until puberty. Her real name was Matoaka; Pocahontas was a teasing nickname that meant something like “little hellion.” When Pocahontas visited Jamestown after Smith’s return, Strachey remembered, she got the boys to turn cartwheels with her, “falling on their hands turning their heels upwards, whom she would follow, and wheel so her self naked as she was all the fort over.”

The English appear to have liked the girl—but not enough to prevent them from abducting her in 1613. They demanded that Powhatan return the English guns he had acquired, but the leader refused to negotiate with people he must have regarded as criminals. Perhaps Pocahontas was angered by her father’s refusal to ransom her. Perhaps she liked being treated royally by the English, who viewed her as a princess. Perhaps Pocahontas, by then a teenager, simply fell in love with one of her captors—decorous, pious, politically adept John Rolfe, who for his part seems to have

truly fallen for her. In any case, she agreed to stay in Jamestown as Rolfe’s bride.

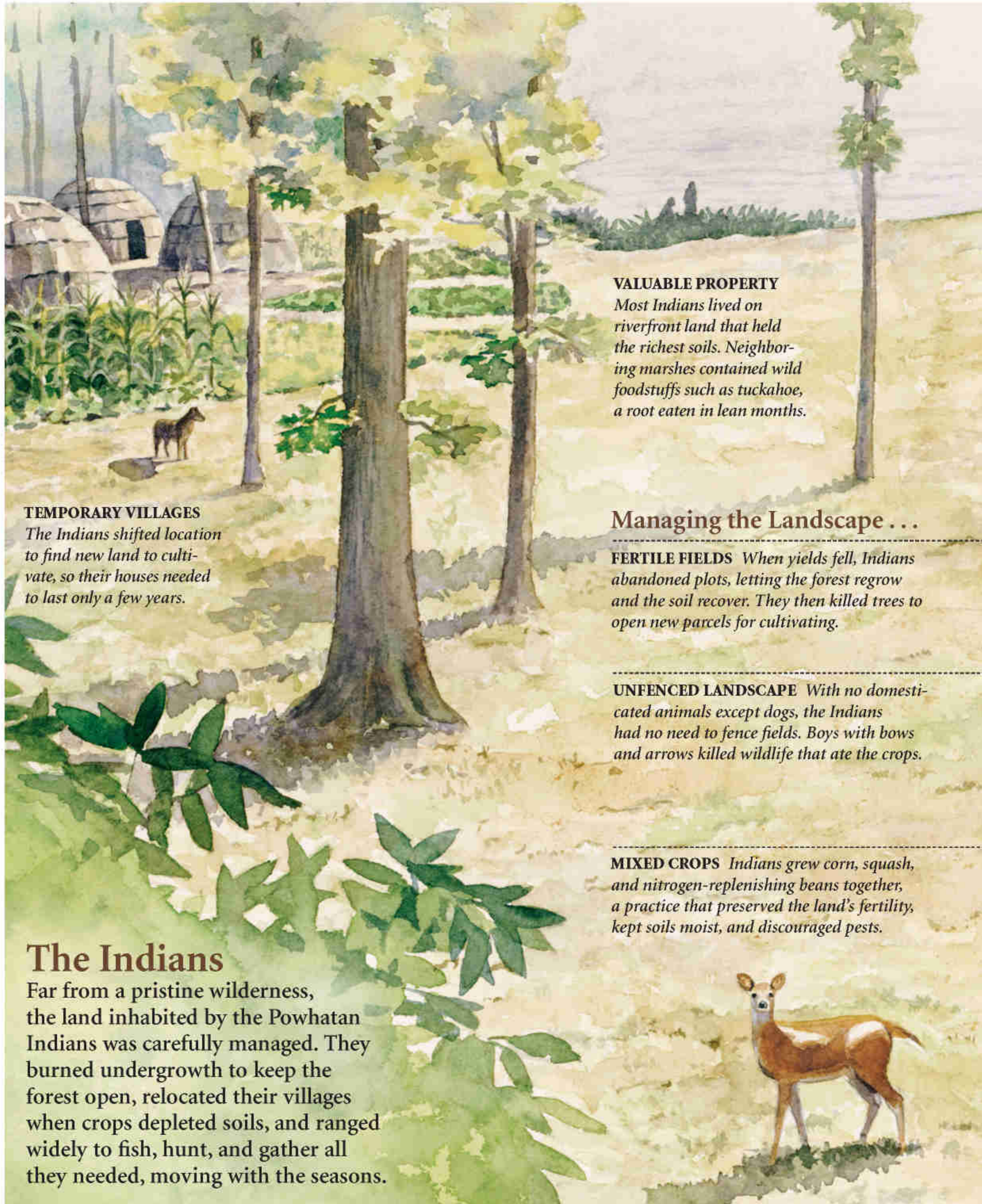
Both Powhatan and Jamestown’s leaders seem to have viewed Pocahontas’s marriage as a *de facto* nonaggression treaty. As relations eased, the foreigners were given free rein to grow tobacco. In Tsenacomoco, the custom was for families to farm their plots and then let them go fallow when yields declined. Any land not currently being planted became common hunting or foraging grounds until needed again for farms. Rolfe and the other tassantassas found a loophole in the system. To them, the Indians’ unfenced land looked unused—no matter that it was purposely kept open by burning, and constantly traversed by hunting and gathering parties. The English cleared this “vacant” land to plant tobacco, but instead of abandoning fields as they were depleted, gave them over to cattle and horses. Rather than cycling the land between farm and forest, they divided it into parcels and kept them in continuous agricultural use—permanently keeping prime farm and forage land away from the James River societies, pushing the Indians farther and farther away from the shore.

Tobacco fueled an addiction for more and more land. The Indians had long grown the crop, but only in small amounts, and in fields that mixed different plants. Driven by the English demand, the colonists covered big stretches of land with *N. tabacum*. Neither natives nor newcomers understood the environmental impact of growing it on a massive scale. “Tobacco has an almost unique ability to suck the life out of soil,” says Leanne DuBois, the agricultural extension agent in James City County. “In this area, where the soils can be pretty fragile, it can ruin the land in a couple of years.” Constantly wearing out their fields, the colonists cleared ever more forest, leaving behind sparse pastureland.

Even in their own villages and farm fields, the Indians couldn’t escape the invasive species brought by the English—pigs, goats, cattle, and horses. Indians woke up to find free-range cows and horses romping through their fields, trampling the harvest. If they killed the beasts,

Unsettling the Landscape

The colonists' arrival at Jamestown 400 years ago unleashed changes that profoundly transformed the environment, shaping the American landscape as we know it.



TEMPORARY VILLAGES

The Indians shifted location to find new land to cultivate, so their houses needed to last only a few years.

VALUABLE PROPERTY

Most Indians lived on riverfront land that held the richest soils. Neighboring marshes contained wild foodstuffs such as tuckahoe, a root eaten in lean months.

Managing the Landscape . . .

FERTILE FIELDS *When yields fell, Indians abandoned plots, letting the forest regrow and the soil recover. They then killed trees to open new parcels for cultivating.*

UNFENCED LANDSCAPE *With no domesticated animals except dogs, the Indians had no need to fence fields. Boys with bows and arrows killed wildlife that ate the crops.*

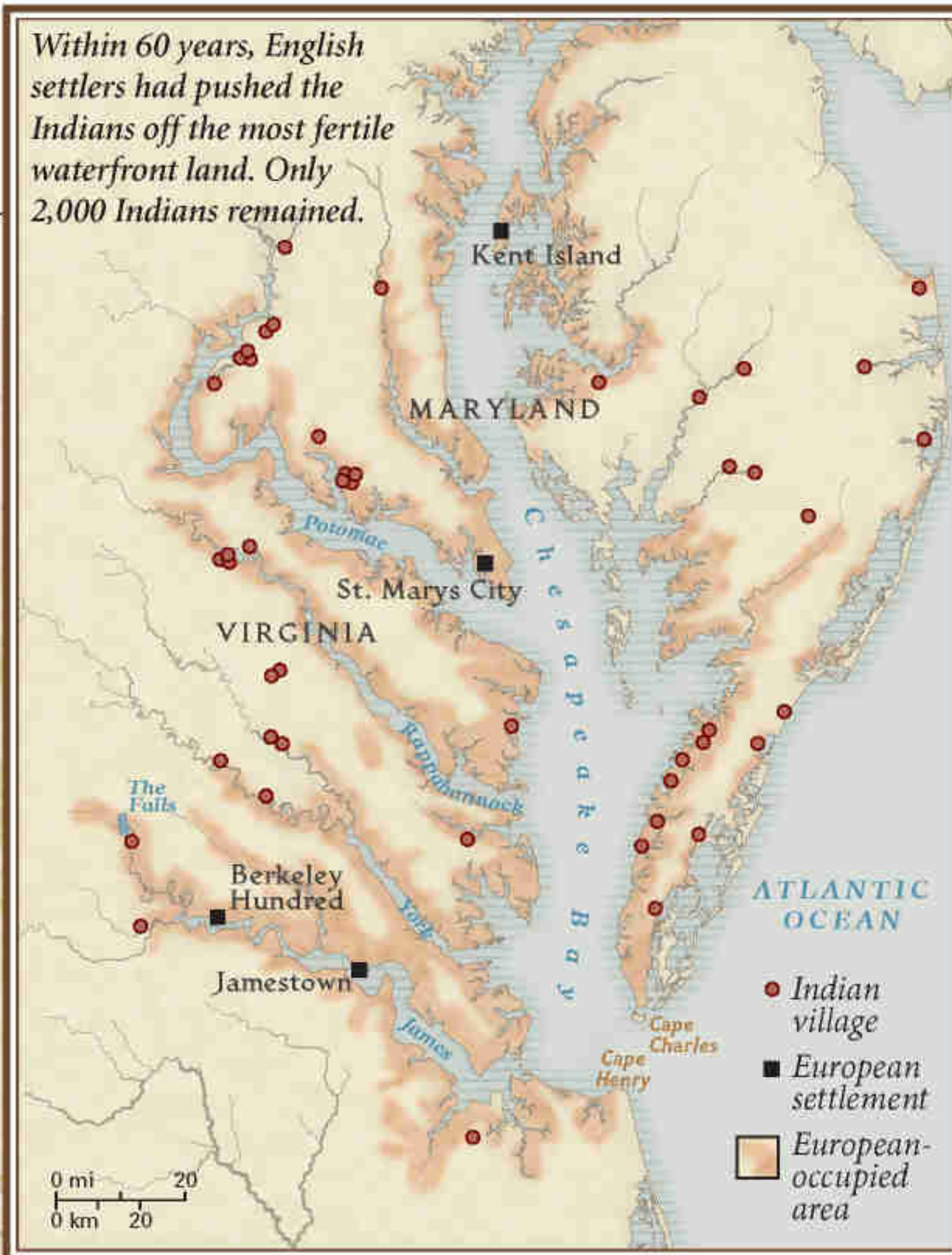
MIXED CROPS *Indians grew corn, squash, and nitrogen-replenishing beans together, a practice that preserved the land's fertility, kept soils moist, and discouraged pests.*

The Indians

Far from a pristine wilderness, the land inhabited by the Powhatan Indians was carefully managed. They burned undergrowth to keep the forest open, relocated their villages when crops depleted soils, and ranged widely to fish, hunt, and gather all they needed, moving with the seasons.

1670

After Settlement



... or Harnessing the Land

SPENT SOIL When tobacco exhausted the land, colonists planted corn for a few years. They then moved on to unfarmed areas, but kept the spent land in use for grazing.

FENCED PLOTS Colonists fenced their fields rather than their livestock, leaving imported cattle and pigs free to trample fields and eat Indian crops and wild edibles.

A CASH CROP Once it proved profitable, tobacco was planted over huge stretches of land. The colonists also brought in non-native fruit trees and grapevines.

The Colonists

As the English adapted a foreign landscape to their needs, they set off cataclysmic changes. An alien presence themselves, they brought in animals, insects, and plants that would literally change the ground beneath the Indians' feet.

"Pleasant, sweet, and strong," said a colonist of West Indian tobacco.

SMALLER, THICKER FOREST

With metal axes, colonists cleared larger areas of woods than the Indians could with stone tools. No longer burned regularly, the remaining forest quickly became overgrown.

STAKING CLAIMS Indians believed they "owned" plots only as long as they tilled them, but settlers took permanent possession of land. With houses and fences they re-created the English landscape.

Agents of Change

MALARIA-CAUSING PARASITE

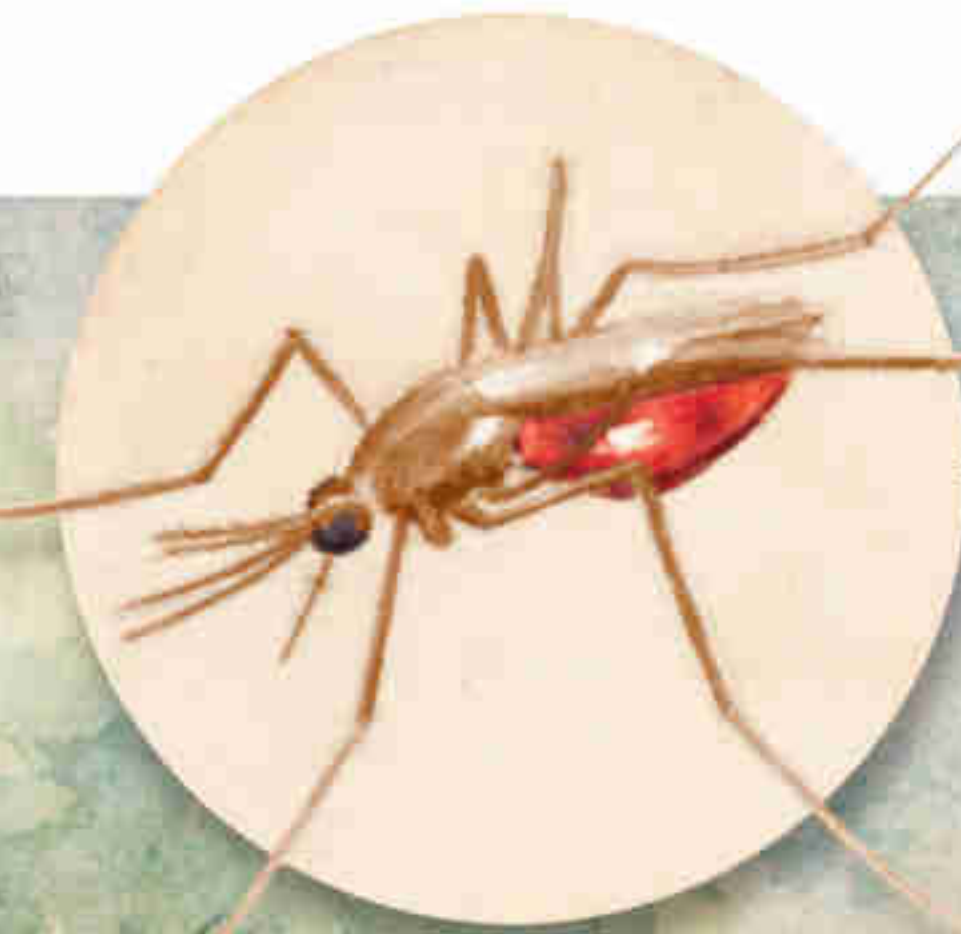
Colonists carried the plasmodium parasite to Virginia in their blood. Mosquitoes along the Chesapeake were "infected" by the settlers and spread the parasite to other humans.

ANIMAL INVADERS

The settlers' livestock, such as cattle and horses, were destructive grazers and soil compactors. Pigs competed with humans for food, and went feral quickly.

GREEDY TOBACCO

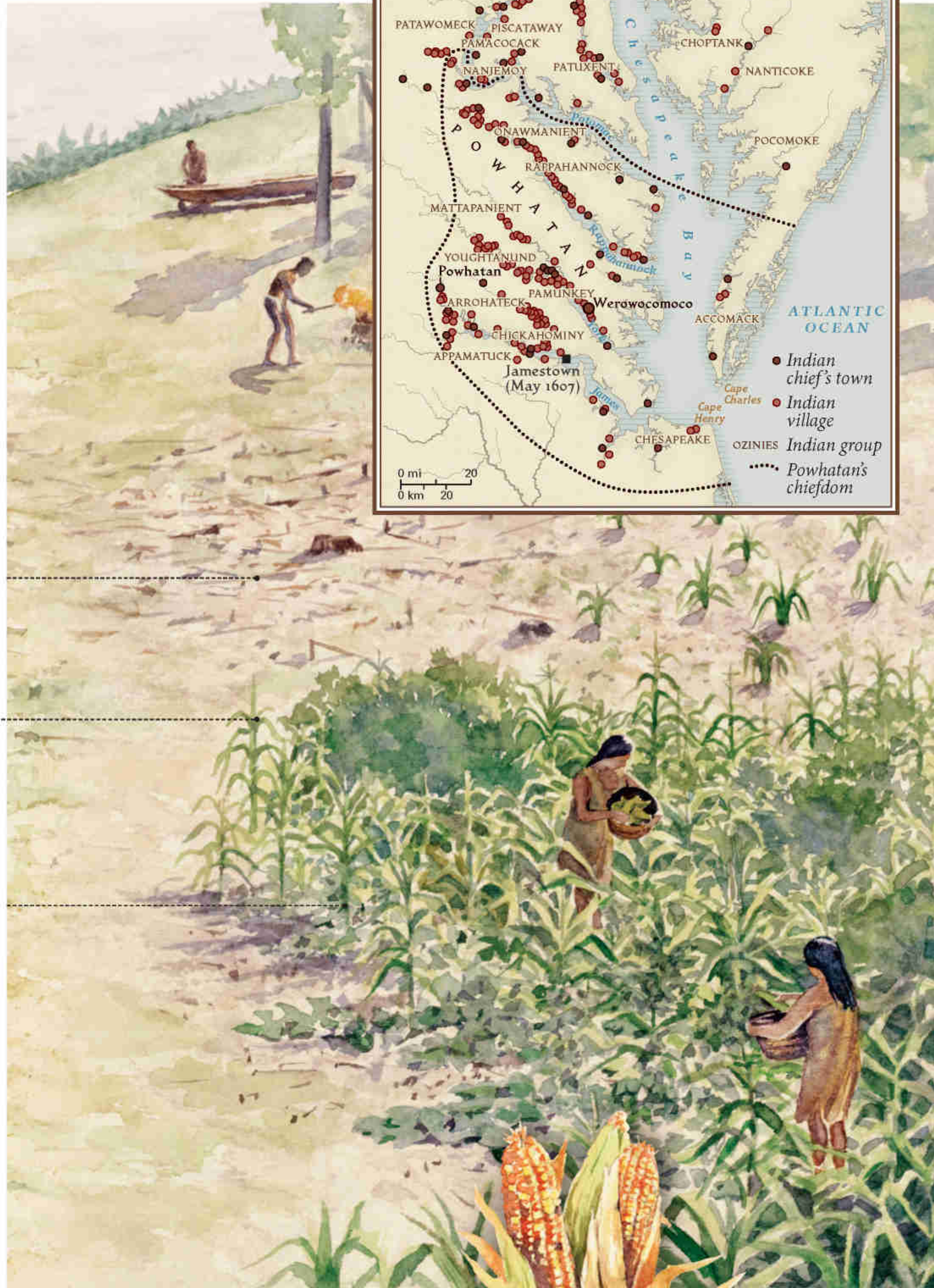
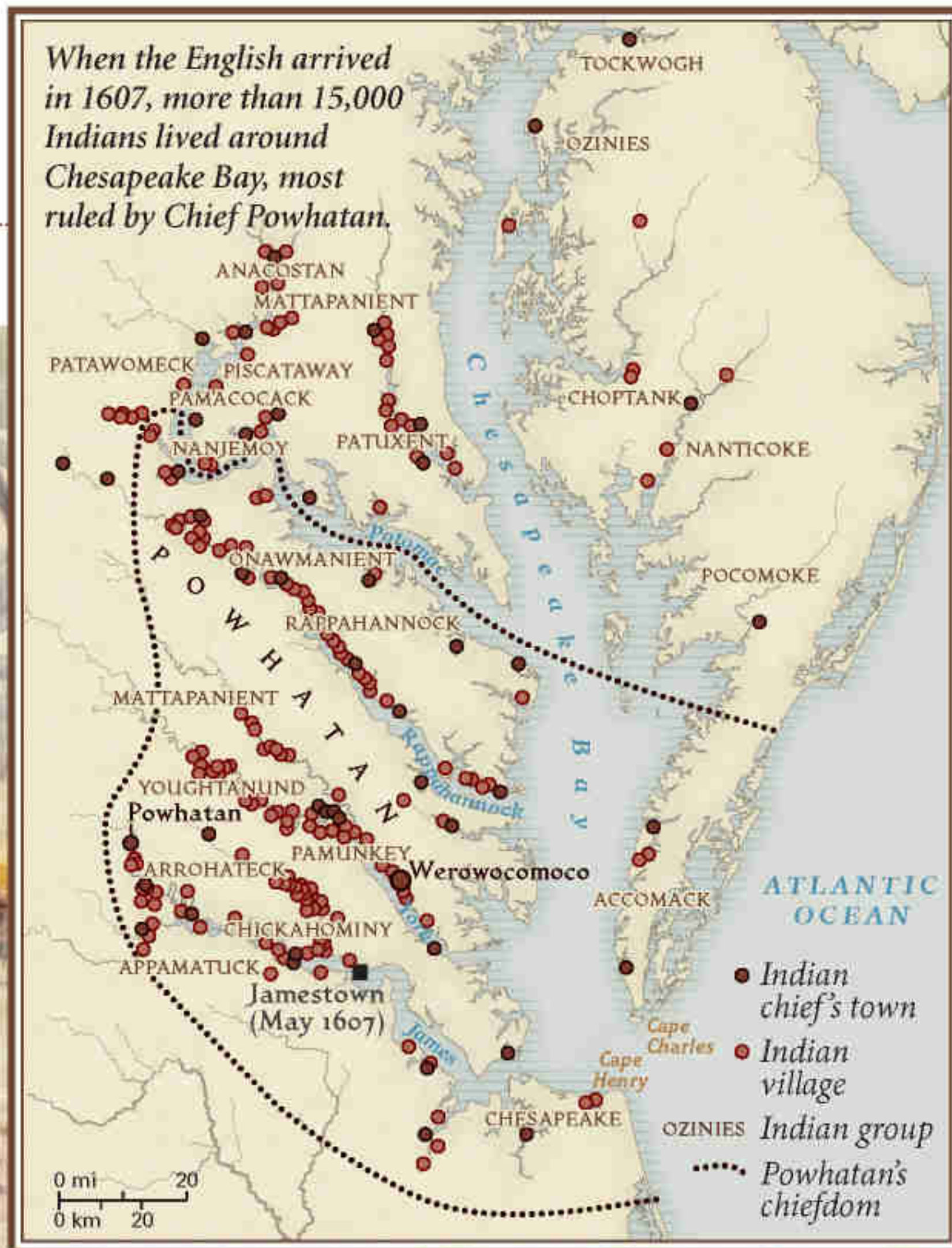
Harder on soil than corn, squash, or beans, tobacco constantly required fresh tracts of land. Farmers harvested much of the plant, leaving little to rot and restore the earth's fertility.



1606

Before Jamestown

When the English arrived in 1607, more than 15,000 Indians lived around Chesapeake Bay, most ruled by Chief Powhatan.



Corn was the “staff of food, upon which the Indians did ever depend,” wrote an English chronicler.

gun-waving colonists demanded payment. To the English, the whole concept of a “civilized” landscape was one in which ownership of the land was signaled by fencing fields and raising livestock. After all, England had more domestic animals per capita than most other European nations. “They looked down on the Indians because they had no domestic animals,” says Virginia DeJohn Anderson, a historian at the University of Colorado at Boulder. At first the imported animals didn’t do well, not least because they were eaten by starving colonists. But during the peace after Pocahontas’s marriage, they multiplied. Colonists quickly lost control of them.

The worst may have been the pigs. Smart, strong, constantly hungry, vicious when crossed, they ate nuts, fruits, shellfish, and corn, turning up the soil with their shovel-like noses in search of edible roots. Among these was tuckahoe, a starchy tuber the Indians relied on when times were hard and their corn crops failed. The pigs liked it, too. The natives found themselves competing for food with packs of feral pigs.

But the largest ecological impact may have been wreaked by a much smaller, seemingly benign domestic animal: the European honeybee. In early 1622, a ship arrived in Jamestown that was a living exhibit of the Columbian exchange. It was loaded with exotic entities for the colonists to experiment with: grapevine cuttings, silkworm eggs, and beehives. Most bees pollinate only a few species; they tend to be fussy about where they live. European honeybees, promiscuous beasts, reside almost anywhere and pollinate almost anything in sight. Quickly, they swarmed from their hives and set up shop throughout the Americas.

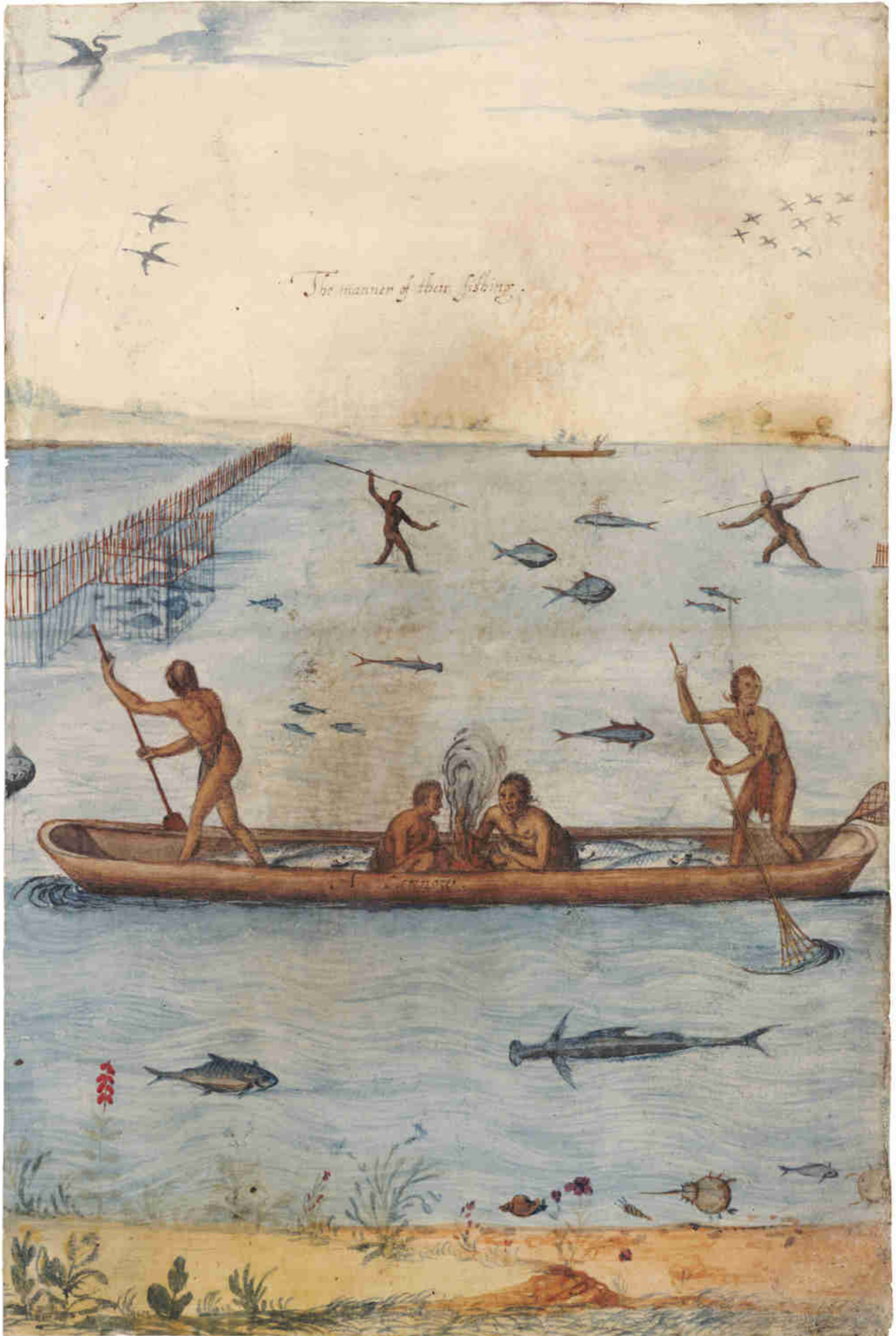
The English imported the bees for honey, not to pollinate crops—pollination wasn’t widely understood until the late 19th century—but feral honeybees pollinated farms and orchards up and down the East Coast anyway. Without them, many of the plants the Europeans brought with them wouldn’t have proliferated. Georgia probably wouldn’t have become the Peach State; Johnny Appleseed’s trees might never have borne

fruit; Huckleberry Finn might not have had any watermelons to steal. So critical to European success was the honeybee that Indians came to view it as a harbinger of invasion; the first sight of one in a new territory, noted French-American writer Jean de Crèvecoeur in 1782, “spreads sadness and consternation in all [Indian] minds.”

The question arises: If the colonists were pushing Powhatan out of Tsenacomoco, why didn’t he push back? Clearly the Indians were more numerous and understood the terrain better. They were also well armed—colonial matchlocks were less accurate than native bows and took longer to reload. One answer is that Powhatan was slow to realize the foreigners would not self-destruct after all. Year after year, they died by the scores, amply proving to him that the English didn’t know how to survive in America. Yet new shiploads just kept coming. Although Powhatan sent representatives to London, he apparently didn’t understand the implications of their reports of its dense population. England could keep replacing colonists, no matter how many died. By the time he realized this, Powhatan was an old and tired man who had lost his appetite for what would have been a bloody enterprise.

Yet this doesn’t explain why his brother Opechancanough, who was distrustful of the tassantassas and took the reins after Powhatan’s death in 1618, didn’t simply destroy the colony. He did organize a violent surprise attack in 1622 that killed almost a third of the English, but despite ongoing skirmishes, he didn’t follow up with another sustained assault for 22 years, by which time the colony was firmly established. Nor does it explain why adjacent Indian groups didn’t strike the foreigners either. One possible

From early spring until the first harvest of corn, Virginia Indians relied on fish caught close to the shore with spears, traps, and nets. After dark they ventured out in canoes lit with fires to attract night feeders. Paddlers steered between oyster reefs so large they might sink a boat.



The manner of their fishing.

By the late 1700s
the Atlantic coast was
lined with such alien crops
as wheat, rice, and
West Indian tobacco.
The Columbian exchange
was in full swing.



WOODEN PLOW, ca 1800

reason is that, by then, the English hadn't just made the landscape inhospitable. It had turned deadly.

THE FIRST KNOWN THANKSGIVING in English America was celebrated on December 4, 1619, at Berkeley Hundred, a brand-new plantation about 30 miles west of Jamestown. Thirty-eight fresh tassantassas had arrived there earlier that day with a deed awarding them title to 8,000 acres. (This transaction likely occurred without consulting the original inhabitants.) Like Jamestown, Berkeley Hundred was a private, for-profit enterprise backed by venture capitalists in England. The main order of business: Grow as much tobacco as possible. But the financial backers also watched out for their employees' spiritual welfare. The day of arrival, they instructed, should be "yearly and perpetually kept holy as a day of thanksgiving to Almighty God." After unloading their baggage, the tassantassas knelt in prayer on the cold shore.

History has not recorded where these kneeling men came from, but records suggest a substantial fraction—as much as a third—of the immigrants in Virginia before 1640 were from the marshes of southern and eastern England. In the 17th century, these areas were rampant with malaria. It was not unusual for 10 or 20 percent of the marsh population to die in a single year, according to Mary Dobson, a medical historian. In contrast to the rest of England, burials outstripped baptisms during much of the 17th and 18th centuries. Little wonder people from these areas wanted to emigrate to the Americas.

But rather than escaping malaria, the colonists brought the disease with them, thanks to the marvelously complicated life cycle of the single-celled plasmodium parasite that causes it. It spends its early stages in the gut of several species in the *Anopheles* mosquito genus. When these mosquitoes bite people, plasmodia swim into their bodies. Once in their new home, the parasites transform themselves into tiny creatures called merozoites, which eventually pop out of red blood cells in synchronized assaults—every 48 hours for *Plasmodium vivax*, the species first introduced into the Americas. Reacting in frenzy to the attack, the body's immune system sets off waves of intense fever and chills.

This type of malaria rarely kills victims directly, but leaves them weak for months, until the body gradually fights it off. But *P. vivax* can hide for as long as five years in the liver of sufferers who appear to have run it out of their systems, producing full-blown malarial relapses every six to nine months. Others can have the disease but show no symptoms, turning people in seeming good health into carriers.

In theory, it would take only one such carrier to arrive at Jamestown and get bitten by one of the mosquito species that inhabit the East Coast to establish malaria in the entire continent. In this way, one or more colonists must have "infected" the New World's mosquitoes with the parasite for malaria. "It's a bit like throwing darts," said Andrew Spielman, the late Harvard professor of tropical public health.

“Bring enough sick people in contact with enough mosquitoes, and sooner or later you’ll hit the bull’s-eye—you’ll establish malaria.”

By 1657 the colonial physician and politician John Winthrop (son of the famed, identically named governor of Massachusetts Bay Colony) was commonly encountering what we now know as malaria in the course of his work. According to Robert Charles Anderson, the genealogist who is transcribing Winthrop’s medical journal, the disease was probably well established in the Massachusetts colony by 1640. Since many more early colonists went to Virginia than Massachusetts, malaria could have been stalking the Tidewater there as early as the 1620s. This is speculative, but not implausible. Once malaria has a chance to get into a place, said Spielman, “it usually gets in fast.”

If malaria arrived early, it may help explain why Opechancanough never mounted a sustained fight against the colonists, even when it became a matter of survival to his people. Malaria effectively saps the vitality of entire regions. In England’s malaria belt, marshlanders were routinely dismissed as stupid, apathetic, and fatalistic. Similar abuse was heaped on the settlers at Jamestown; Strachey was one of many who denounced what he saw as their propensity for “sloth, riot, and vanity.” But at least England could ship in new colonists rapidly. The Indians could not. If a substantial fraction of their population was malarious, it would have limited their ability to attack the colonists. From the native point of view, it would have been as if the environment around them had suddenly become toxic.

No matter how the parasite was actually introduced to Virginia, we know that malaria spread throughout the East Coast, eventually playing a major part in the pageant of U.S. history. Without malaria, slaves would have been less desirable to southern planters: Most people from tropical Africa are resistant to the plasmodium parasite, the product of millennia of evolution in its presence. The disease became especially endemic in the Carolinas, where it crippled the army of British Gen. Charles Cornwallis during the Revolutionary War. England had by that time drained

its marshes and largely been freed of malaria. Meanwhile, the colonists had become seasoned. “There was a big imbalance. Cornwallis’s army was simply melting away,” says J. R. McNeill, an environmental historian at Georgetown University. McNeill takes pains to credit the bravery of the Revolution’s leaders. But a critical role was played by what he wryly refers to as “revolutionary mosquitoes.” Cornwallis surrendered, effectively ending the war, on October 19, 1781.

By then the Columbian exchange was in full swing. The Atlantic coast was dotted with monoculture fields devoted to such alien crops as wheat, rice, and West Indian tobacco. Black rats from Europe were devouring Indian corn stores from Maine to Florida. Meanwhile, European farmers were adopting New World plants like corn, potatoes, and tomatoes; chili peppers, unknown in Asia before Columbus, were on their way to taking over Indian, Thai, and Chinese kitchens.

No longer maintained by Indian burning, the shrinking forests of the East would become choked with underbrush—the overgrown, uninhabited “wilderness” celebrated by Thoreau. In the 1800s, the great grasslands of the Midwest, once kept open by native burning, began filling with trees. With the Indians vanquished by disease, some archaeologists believe, species they had formerly hunted, such as the passenger pigeon, experienced a population explosion.

On the James River, where the process began, land-clearing sped runoff and increased the river flow, sweeping aside the mats of vegetation that lined its banks in Powhatan’s day. With its plantations, tobacco fields, and rolling meadows, the landscape of the Chesapeake Bay had been utterly transformed. It looked more like England than it had when Jamestown began, but it wasn’t at all the same. Four centuries ago, the English didn’t discover a New World—they created one.

📌 **An Artistic Look** See more of John White’s watercolors depicting Indian life in 16th-century America at ngm.com/0705. For information on an exhibit of White’s work at the British Museum, go to www.thebritishmuseum.ac.uk/aneworld.



An 800-year-old water tupelo evokes the ancient forest the English found throughout Virginia in 1607.



GEORGE STEINMETZ

Within 300 years most of the forest was gone, lost to farming and logging as settlers took the Indians' land. □

What would you take to the New World?

BY KAREN E. LANGE
NATIONAL GEOGRAPHIC STAFF

PHOTOGRAPHS
BY ROBERT CLARK



They must have known the odds were against them. Before the English sailed to Virginia in the early 1600s, every previous European attempt to colonize the coast between Nova Scotia and Florida met with disaster. And yet the Virginia Company's London investors found thousands willing to take the chance. As they packed their bags, the colonists imagined long lives ahead of them in a comfortable and prosperous colony: Gentlemen tucked pewter flacons into their sea chests, along with irons for pressing ruffles into their collars. Maids filled trunks with petticoats and sheets. One colonist brought a set of porcelain cups, another a miniature windmill for diversion. Their ships were filled with crates of hoes and axes, boxes of muskets and armor, and equipment for turning a profit: jars to collect medicinal plants, crucibles for manufacturing glass, and stills to refine that most sought after discovery—gold.

It didn't take long for the settlers' early dreams to evaporate. One after another, business schemes failed, and those who had envisioned riches turned to praying for survival. Many colonists perished within

A tag stamped with an archaic spelling of Jamestown once marked goods bound for the colony. Soldiers in the remote outpost gambled with bone, ivory, and lead dice to pass the time—an activity banned in 1611 in an effort to restore discipline.



months of stepping ashore. Three out of four who came to Jamestown between 1607 and 1624 died from disease, hunger, and conflict with the Indians.

Until recently, their tales were told only through written accounts of a literate few. Since 1994, Historic Jamestowne archaeologists led by William Kelso have dug up a fuller story: a million artifacts that reveal in minute detail the lives and deaths of settlers, both elite and ordinary, as they struggled to establish a colony that would become the first permanent English settlement in North America—and the birthplace of the United States.

“It’s like finding a lost letter from the past,” says curator Bly Straube. Little by little, the things the colonists brought with them across the Atlantic joined their bodies in Virginia’s strange soil, buried testaments to the hope with which they embarked on an all too perilous journey.

SIFTING HISTORY

A tray of washed artifacts strained from a pit in the fort testifies to life at Jamestown between 1610 and 1640 (clockwise from upper left): English flint used as ballast in supply ships and to light fires; shells of Chesapeake oysters that fed the colonists; wrought iron nails for building; clay tobacco pipes along with European pottery and scrap copper reworked into ornaments for the Indians; the butchered remains of imported pigs, Eastern box turtles and sturgeon; and coral from the West Indies, a popular stopping point for transatlantic voyages.





“The land which we have searched out is a very good land, and if the Lord love us, he will bring our people to it, and give it to us for a possession.”

—Robert Johnson

PERSONAL EFFECTS

A black mineral crucifix that may have belonged to one of Jamestown's few Catholics speaks to the colonists' Christian faith, to which they hoped to convert the Indians. Jamestown's leaders wanted to transplant English society to Virginia. The settlement's gentlemen carried objects to display their rank, such as a skeleton-embossed seal for impressing its owner's initials in wax, and a silver toothpick and ear cleaner (below). A dancing boy figurine was probably a gift for the Indians, meant to display English "civilization."







“Powhatan promised to give me corn, venison, or what I wanted to feed us, hatchets and copper we should make him, and none should disturb us.”

—John Smith

FAIR TRADE

The English secured the friendship of the Powhatan Indians with trade goods such as Venetian glass and stone beads (opposite), metal tools and weapons, and copper—which the Indians prized as a sign of status. In return, the English received gifts: A quartz arrowhead (below, left) and deer meat and native corn, charred cobs of which were excavated at Jamestown. But the relationship went sour when the English pressured Indians to sell them food during a drought, and the Powhatan realized the colonists meant to take their land.





“Many through extreme hunger
have run out of their naked beds,
being so lean that they looked
like skeletons, crying out,
‘We are starved! We are starved!’”

—George Percy

HEMME D I N

Outnumbered by the Powhatan Indians hundreds to one, the English withdrew behind palisades during attacks, defending the fort with muskets and sharp iron caltrops (opposite, top) scattered on the ground. Cannonballs were intended for an enemy that never came: Spain’s navy.

S T A R V I N G T I M E

When the Powhatan besieged Jamestown in the winter of 1609-1610, trapped settlers were reduced to eating horses, cats and dogs, and even the black rats they unwittingly brought to Virginia aboard their ships (jawbone below). Weakened by hunger and sickened by drinking foul water from the river and contaminated wells, scores of English died. Survivors were ready to give up and go home, but the spring brought new colonists and fresh supplies.





HOT COMMODITIES

A German stoneware jug from Frechen (opposite) and a brass thimble and pins from Nürnberg made their way to the colony via London. The English came to Virginia searching for a valuable export to give them an edge in the booming 17th-century economy. After trials and much error, they discovered their best bet was growing sweet-tasting tobacco, whose popularity is reflected in scores of locally made pipes unearthed at Jamestown (below). The Virginia Company failed, but the Jamestown colony ultimately succeeded—thanks to a crop near as precious as gold. □

➤ **Eye on Jamestown** Hear what the experts have to say as you explore Jamestown in an interactive feature at ngm.com/0705.









DHARAVI

MUMBAI'S SHADOW CITY

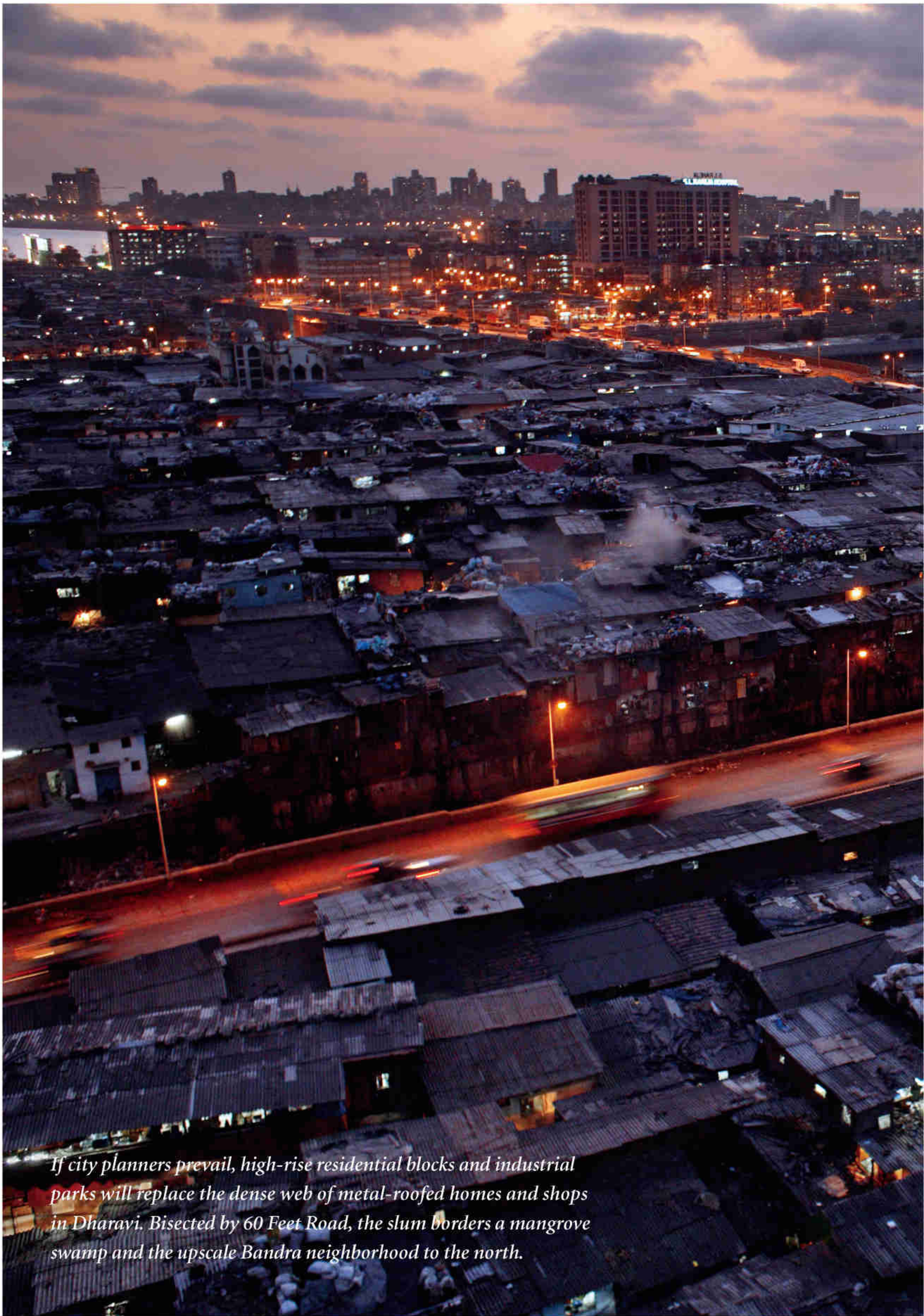
Some call the Dharavi slum an embarrassing eyesore in the middle of India's financial capital. Its residents call it home.

A young girl strolls along a leaky water pipe through Dharavi's industrial district.



Fifteen members—and three generations—of the Shilpiri family dwell in two small rented rooms. With the patriarch crippled, at right, and husbands missing or dead, the household survives on what the women earn by cleaning houses and selling sugarcane.





If city planners prevail, high-rise residential blocks and industrial parks will replace the dense web of metal-roofed homes and shops in Dharavi. Bisected by 60 Feet Road, the slum borders a mangrove swamp and the upscale Bandra neighborhood to the north.



BY MARK JACOBSON
PHOTOGRAPHS BY
JONAS BENDIKSEN

ALL CITIES IN INDIA ARE LOUD, but nothing matches the 24/7 decibel level of Mumbai, the former Bombay, where the traffic never stops and the horns always honk. Noise, however, is not a problem in Dharavi, the teeming slum of one million souls, where as many as 18,000 people crowd into a single acre. By nightfall, deep inside the maze of lanes too narrow even for the *putt-putt* of auto rickshaws, the slum is as still as a verdant glade. Once you get accustomed to sharing 300 square feet of floor with 15 humans and an uncounted number of mice, a strange sense of relaxation sets in—ah, at last a moment to think straight.

Dharavi is routinely called “the largest slum in Asia,” a dubious attribution sometimes conflated into “the largest slum in the world.” This is not true. Mexico City’s Neza-Chalco-Itza barrio has four times as many people. In Asia, Karachi’s Orangi Township has surpassed Dharavi. Even in Mumbai, where about half of the city’s swelling 12 million population lives in what is euphemistically referred to as “informal” housing, other slum pockets rival Dharavi in size and squalor.

Yet Dharavi remains unique among slums. A neighborhood smack in the heart of Mumbai, it retains the emotional and historical pull of a subcontinental Harlem—a square-mile center of all things, geographically, psychologically, spiritually. Its location has also made it hot real estate in Mumbai, a city that epitomizes India’s hopes of becoming an economic rival to China. Indeed, on a planet where half of humanity will soon live in cities, the forces at work in Dharavi serve as a window not only



A Dharavi street pulses with merriment for the

on the future of India’s burgeoning cities, but on urban space everywhere.

Ask any longtime resident—some families have been here for three or more generations—how Dharavi came to be, and they’ll say, “We built it.” This is not far off. Until the late 19th century, this area of Mumbai was mangrove swamp inhabited by Koli fishermen. When the swamp filled in (with coconut leaves, rotten fish, and human waste), the Kolis were deprived of their fishing grounds—they would soon shift to bootlegging liquor—but room became available



Hindu festival honoring a favorite god of the working class, elephant-headed Ganesh, who offers good luck.

for others. The Kumbhars came from Gujarat to establish a potters' colony. Tamils arrived from the south and opened tanneries. Thousands traveled from Uttar Pradesh to work in the booming textile industry. The result is the most diverse of slums, arguably the most diverse neighborhood in Mumbai, India's most diverse city.

Stay for a while on the three-foot-wide lane of Rajendra Prasad Chawl, and you become acquainted with the rhythms of the place. The morning sound of devotional singing is followed by the rush of water. Until recently few people

in Dharavi had water hookups. Residents such as Meera Singh, a wry woman who has lived on the lane for 35 years, used to walk a mile to get water for the day's cleaning and cooking. At the distant spigot she would have to pay the local "goons" to fill her buckets. This is how it works in the bureaucratic twilight zone of informal housing. Deprived of public services because of their illegal status, slum dwellers often find themselves at the mercy of the "land mafia." There are water goons, electricity goons. In this regard, the residents of Rajendra Prasad Chawl

are fortunate. These days, by DIY hook or crook, nearly every household on the street has its own water tap. And today, like every day, residents open their hoses to wash down the lane as they stand in the doorways of their homes to brush their teeth.

This is how Dharavi wakes up. On 90 Feet Road, named for its alleged width (even if 60 Feet Road, the slum's other main drag, is considerably wider), the cab drivers coax their battered Fiats to life. In the potters' neighborhood, black smoke is already pouring from six-foot-square kilns. By the mucky industrial canal, the recyclers are in full swing. In Dharavi nothing is considered garbage. Ruined plastic toys are tossed into massive grinders, chopped into tiny pieces, melted down into multicolored pellets, ready to be refashioned into knockoff Barbie dolls. Here every cardboard box or 55-gallon oil drum has another life, and another one after that.

Mornings at Rajendra Prasad Chawl are equally hectic. With the eight furniture makers to whom she rents part of her apartment gone for the day, Meera Singh combs the hair of her grandchildren: Atul, 7, Kanchan, 10, and Jyoti, 12. Soon the apartment, home to 15, is empty, save for Meera and her twentysomething son, Amit, he of the dashing mustache and semi-hipster haircut. A couple of years ago, the Singh family, like everyone else in Dharavi, sat in front of the television to see local singer Abhijit Sawant win the first *Indian Idol* contest. But now Meera is watching her favorite TV personality, the orange-robed yoga master, Baba Ramdev, who demonstrates an antiaging technique: rubbing

your fingernails against each other at a rapid pace.

"Why listen to this fool?" dismisses Amit.

"You know nothing," Meera shoots back. "His hair is black, and he is more than 80 years old."

"Eighty? He's no more than 40. Don't fall for these cheating tricks."

Meera shakes her head. She gave up trying to talk sense to Amit long ago. "His head is in the clouds," she says. She wishes he'd get a job as did his brother Manoj, who sews jeans in one of Dharavi's *kaarkhanas*, or sweatshops. But this is not for him, Amit says. A thinker, he sees his life in terms of "a big picture." Central to this conceit is the saga of how the Singhs came to Dharavi in the first place. Members of the Kshatriyas, regarded as second only to Brahmans in the caste system, Amit's great uncles were *zamindars*, or landlords, in the service of the British. Stripped of privilege after independence, the family moved from Uttar Pradesh to Mumbai, where Amit's father worked in the textile mills. The collapse of the mills in the 1970s landed the family in Dharavi.

It is this story of chance and fate ("A hundred years ago we would have been bosses," he says) that spurs Amit's outsize sense of self. He's always got a dozen things going. There's his soap powder pyramid scheme, his real estate and employment agency gambits. New is his exterminator firm, for which he has distributed hundreds of handbills ("No bedbug! No rat!"), claiming to be Dharavi's "most trusted" vermin remover, despite having yet to exterminate one cockroach.

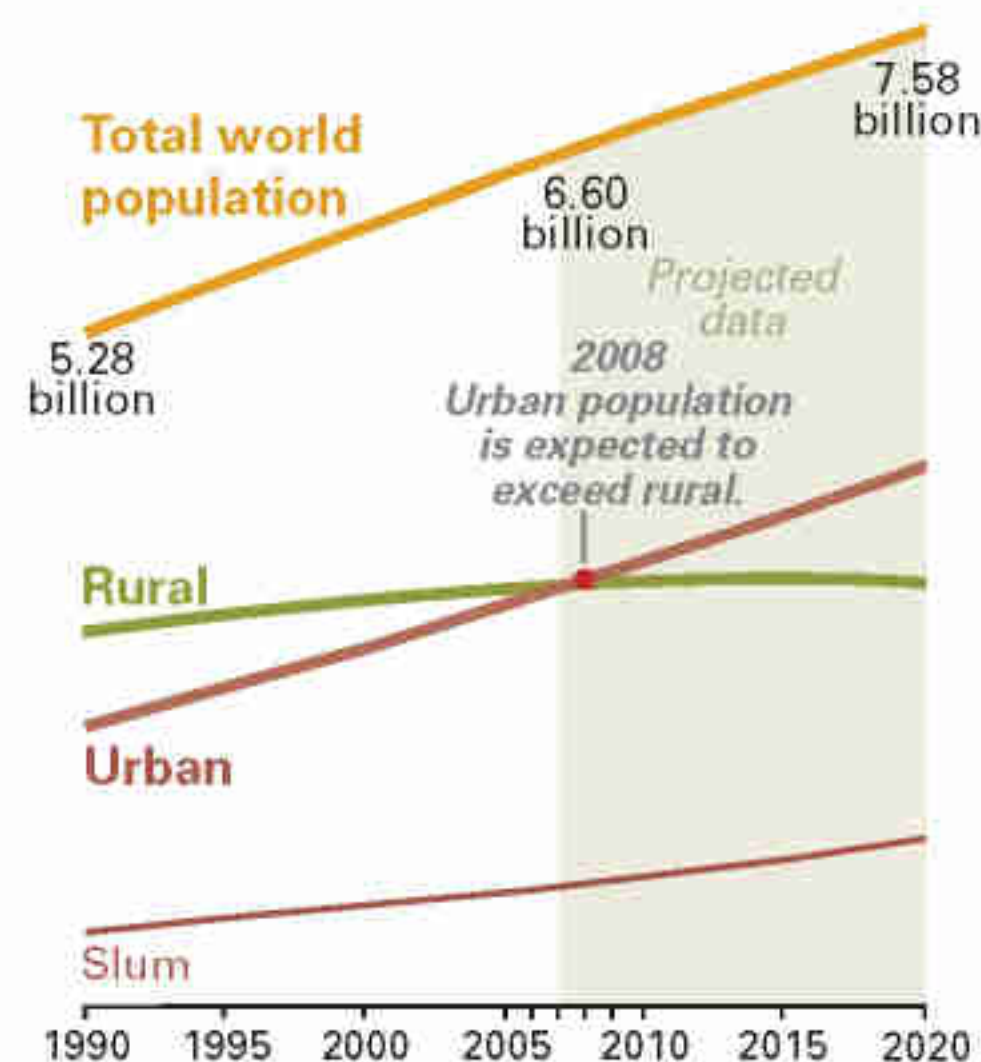
Also on Amit's agenda is the *Janhit Times*, a

A RISING TIDE OF SLUM DWELLERS

Next year, for the first time in history, the number of people living in cities is projected to surpass those in rural areas. And odds are the person who tips the momentous urban-rural balance will be moving into a slum.

The United Nations defines a slum as an urban area where most residents live in crowded, illegal housing that lacks clean

water and adequate sanitation. Today the UN estimates that more than a billion people live in slums—a third of the urban population—with the number expected to swell as the rural exodus continues. Without improvement in basic infrastructure, aid officials warn that a "silent tsunami" of illness and death could overwhelm the world's slums.



A CITY WITHIN A CITY

Once a precarious squatters community, Dharavi today is considered a “mature slum,” in which residents have upgraded from flimsy shelters to concrete dwellings. Redevelopment schemes have been tried for decades, but most of the slum remains a jumble of homes and businesses lining its narrow pathways.



- Developed 1991 to present
- Developed late 1980s to early 1990s
- Undeveloped slum

In a city where half of the 12 million inhabitants live in shantytowns, Dharavi ranks as perhaps the most well established of Mumbai’s slums, with an intricate system of neighborhoods, work districts, schools, mosques, and churches. One of Asia’s largest slums, it is home to a million people squeezed onto 550 acres of swampy landfill in the heart of

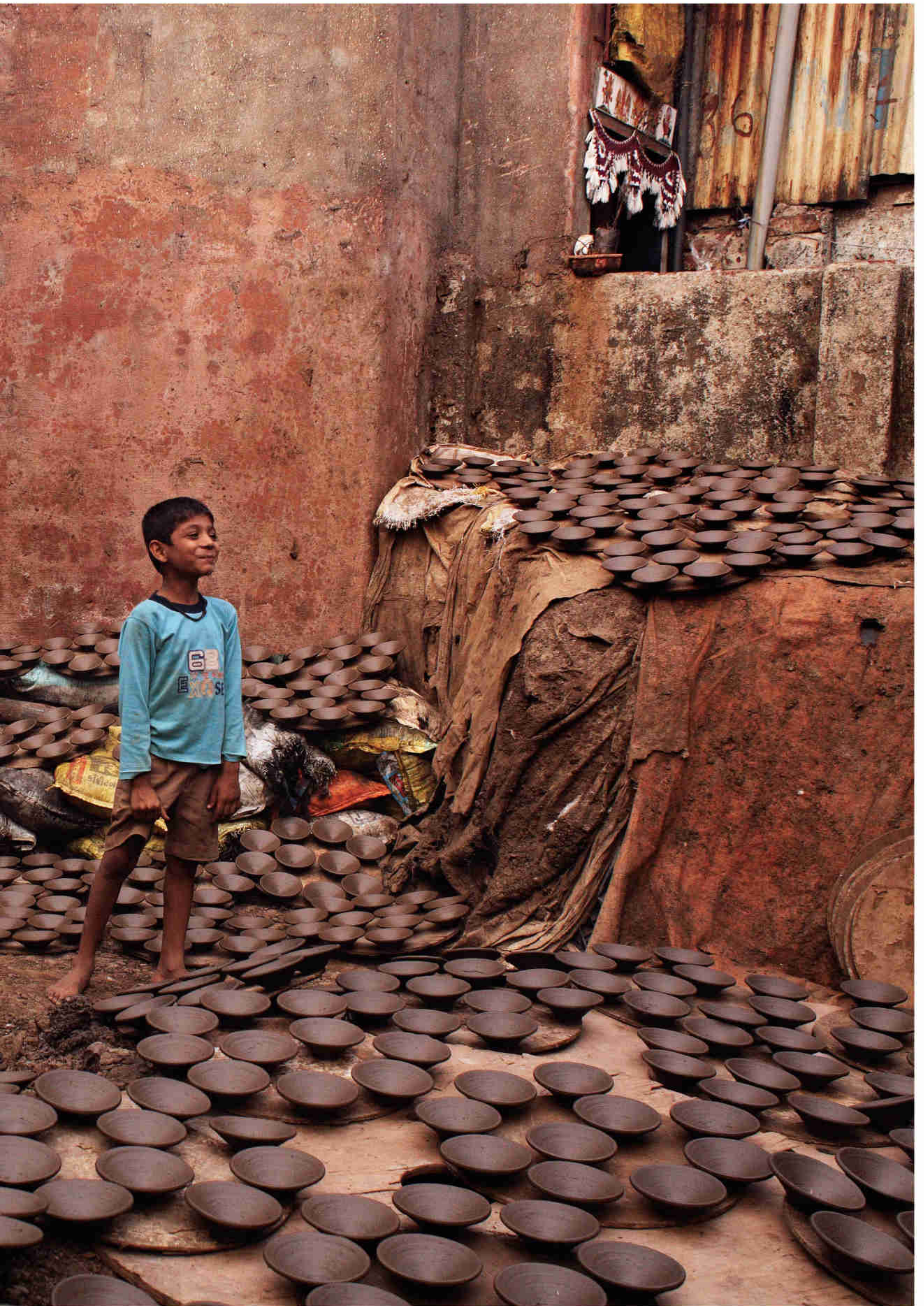
India’s financial capital. Because of Dharavi’s central location, just across from the Bandra-Kurla Complex, city officials want to raze the slum, move the poor to high-rises, and redevelop the area to attract more affluent residents. Because previous schemes have failed, leaving behind “vertical slums,” many residents oppose the renewal plan.



SOURCES: MUKESH MEHTA AND PRANJALI PRADHAN, MM CONSULTANTS; UN HABITAT (GRAPH); IMAGE BY DIGITALGLOBE; NGM MAPS.



A potter's son surveys a yard paved with drying clay bowls, the traditional work of the Kumbhar caste, who set up their communal clay pits and kilns in the 1930s. The Kumbhars fear that any slum renewal will shrink their space or force them to relocate.



tabloid he envisions as a hard-hitting advocate of grassroots democracy. The first edition featured a story about an allegedly corrupt Dharavi policeman. Amit's headline: "A Giant Bastard, a Dirty Corrupted Devil, and Uniformed Goon." Cooler heads, pointing out the policeman wielded a lethal lathi (bamboo nightstick), suggested a milder approach. Reluctantly Amit went with "A Fight for Justice."

Even though the paper has yet to print its first edition, Amit carries a handsome press pass, which he keeps with his stack of business cards. This leads his mother to remark, "That's you, many cards, but no businesses." Looking at her son, she says, "You are such a dreamer."

It is an assessment that Amit, who just decided to open a rental car agency in hopes of diversifying his portfolio in the mode of "a Richard Branson of Dharavi," does not dispute.

"I had an epiphany. I decided to dedicate my life to fixing the slums,"

"Talk about doing something about Mumbai slums, and no one pays attention. Talk about Dharavi, and it is Mission Impossible, an international incident," says Mukesh Mehta as he enters the blond-paneled conference room of the Maharashtra State Administration Building. For nine years, Mehta, a 56-year-old architect and urban designer, has honed his plan for "a sustainable, mainstreamed, slum-free Dharavi." At today's meeting, after many PowerPoint presentations, the plan is slated for approval by the state chief minister, Vilasrao Deshmukh.

Dharavi is to be divided into five sectors, each developed with the involvement of investors, mostly nonresident Indians. Initially, 57,000 Dharavi families will be resettled into high-rise housing close to their current residences. Each family is entitled to 225 square feet of housing, with its own indoor plumbing. In return for erecting the "free" buildings, private firms will be given handsome incentives to build for-profit housing to be sold at (high) market rates.

"All that remains is the consent," Mehta tells Deshmukh, a sour-looking gentleman in a snow-white suit sitting with his advisers at the 40-foot conference table. Normally, it is required that 60

percent of Dharavi residents approve of the plan.

But Deshmukh announces that formal consent is not needed because Mehta's plan is a government-sponsored project. All he must do is give the residents a month to register complaints. "A 30-day window, not a day more," Deshmukh says with impatient finality.

Later, as his driver pilots his Honda Accord through traffic, Mehta is smiling. "This is a good day," he says. "A dream come true."

At first glance, Mehta, resident of an elegant apartment building on swank Napean Sea Road, a longtime member of the British Raj-era Bombay Gymkhana and Royal Bombay Yacht Club, does not appear to be a Dharavi dreamer.

"You could say I was born with a golden spoon in my mouth," he remarks at his West Bandra office overlooking the Arabian Sea. "My father came to Bombay from Gujarat without a penny

and built a tremendous steel business. An astrologer told him his youngest son—me—would be the most successful one, so I was afforded everything." These perks included a top education, plus a sojourn in the U.S., where Mehta studied architecture at Pratt Institute in Brooklyn.

"For me, America has always been the inspiration," says Mehta, who made a fortune managing his father's steel business before deciding to develop real estate on Long Island's exclusive North Shore. "Great Gatsby country," he says, detailing how he built high-end houses and lived in Centre Island, a white community with "the richest of the rich"—such as Billy Joel, who recently listed his mansion for 37.5 million dollars.

"The slums were the furthest thing from my mind," Mehta says. This changed when he returned to Mumbai. He saw what everyone else did—that the city was filled with a few rich people, a vast number of poor people, and hardly anyone in the middle. This was most evident in the appalling housing situation. The city was split between the Manhattan-priced high-rises that dotted the south Mumbai skyline and those brownish areas on the map marked with the letters ZP for *zopadpatti*, aka slums.

Downtown business people railed that the slums were choking the life out of the city, robbing it of its rightful place in the 21st century. After all, India was no longer a post-colonial backwater famous only for the most wretched people of the Earth and the gurus who appealed to gullible Beatles. Now, when a computer broke in Des Moines, the help desk was in Bangalore. Economists were predicting exactly when the Indian GNP was likely to surpass that of the United States. If Mumbai was going to achieve its stated destiny of becoming a world-class metropolis, a rival to China's soaring Shanghai, how could that happen when every bit of open space was covered with these eyesores, these human dumps where no one paid taxes? For Mukesh Mehta, if India were to become the ideal consumer society, it would have to develop a true middle class—and housing would be the

happened. I opened an office in Dharavi, started talking to people, seeing who they were, how hard they worked, and how you could be there for months and never once be asked for a handout.”

It was then, Mehta says, “I had an epiphany. I asked myself if these people were any different from my father when he first came from Gujarat. They have the same dreams. That was when I decided to dedicate the rest of my life to fixing the slums. Because I realized: The people of Dharavi—they are my genuine heroes.”

BACK ON RAJENDRA PRASAD CHAWL, news of the plan's approval was met with a decidedly mixed response. Meera Singh barely looked up from Baba Ramdev's lecture. She had heard often the stories about Dharavi's supposed transformation. Nothing much ever happened. Why should Mukesh Mehta's scheme be any different?

says Mehta. “Because I realized: The people of Dharavi are my heroes.”

engine. The slums would have to be reclaimed.

But which slums? There were so many of them. Then it jumped out, as clear as real estate's incontrovertible first axiom, *location, location, location*: Dharavi, right in the middle of the map. It was a quirk of geography and history, as any urban planner will tell you (the American inner city aside): Large masses of poor people are not supposed to be in the center of the city. They are supposed to be on the periphery, stacked up on the outskirts. Dharavi had once been on the northern fringe, but ever growing Mumbai had sprawled toward the famous slum, eventually surrounding it.

It didn't take a wizard to see the advantages of Dharavi's position. Served by two railway lines, it was ideally situated for middle-class commuters. Added to this was the advent of the Bandra-Kurla Complex, a global corporate enclave located directly across the remaining mangrove swamps, as close to Dharavi as Wall Street is to Brooklyn Heights. Sterile and kempt, the BKC was the future, right on the doorstep of the zopadpatti.

“I approached it as a developer. In other words, as a mercenary,” says Mehta, satellite images of Dharavi spread across his desk. “But something

Moreover, what reason would possess her to move into a 225-square-foot apartment, even if it were free? She has nearly 400 square feet. “Informal housing” has been good to her. She receives 1,100 rupees a month from the furniture workers and another thousand from renting her basement. Why should she give this up for a seven-story apartment building where she'll be saddled with fees, including “lift” charges? She doesn't like to ride in elevators. They give her the creeps.

Amit Singh was more outspoken. Mehta's plan was nothing more than “a scam, a chunk of fool's gold.” Amit was already drafting an editorial in the *Janhit Times* demanding a citizen's arrest of “the gangster Mehta.”

In a place with one toilet for every few hundred people (the so-called politics of defecation is a perennial hot button in India), the prospect of having one's own bathroom would seem to be a powerful selling point for the plan. But even if a stir broke out last summer when gurus declared that the waters of Mahim Creek, the slum's reeking unofficial public toilet, had miraculously turned “sweet” (leading to much gastrointestinal trauma), many Dharavi locals were unmoved by the idea (Continued on page 86)

The old becomes new in the hands of laborers inside a steamy warehouse who repair used cooking oil cans for resale. Dharavi specializes in recycling plastics and other trash. The lucrative business is run by Muslims, about a third of the slum's population.







HARD LABOR

The chance to earn a few dollars a day—and save for family and future—draws laborers from across India to Dharavi, whose off-the-books, largely unregulated industries annually churn out some 500 million dollars' worth of goods. In the Kalyanwadi tanning district, workers handle dry cowhides (above) that will end up as purses and jackets stitched with fake designer labels. Often the work is dirty and punishing.





At a laundry pool grimy with sewer runoff (below left), laborers from the state of Andhra Pradesh make ten cents per piece of clothing. A man from Uttar Pradesh uses the space between municipal water pipes to pound old paint chips into fine powder (above), which will be reconstituted into paint. Out of sight behind flimsy walls hum hundreds of sweatshops. At an around-the-clock garment factory, a worker from Tamil Nadu (below) sleeps before his next shift.



(Continued from page 81) of a personal loo.

“What need do I have of my own toilet?” asks Nagamma Shilpiri, who came to Dharavi from Andhra Pradesh 20 years ago and now lives with her crippled father and 13 other relatives in two 150-square-foot rooms. Certainly, Shilpiri is embarrassed by the lack of privacy when she squats in the early morning haze beside Mahim Creek. But the idea of a personal flush toilet offends her. To use all that water for so few people seems a stupid, even sinful, waste.

Everyone in Dharavi had their own opinion about how and why the plan was concocted to hurt them in particular. The most nuanced assessment came from Shaikh Mobin, a plastics recycler in his mid-30s. Mobin has lived his whole life in Dharavi, but he'd never call himself a slum dweller. His recycling business, started by his grandfather, passed to his father, and now to him

steady electricity or water, at the mercy of the goons and the malarial Mumbai heat.

But when it comes down to it, Mobin says, Dharavi's dilemma is at once much simpler and infinitely more complex: “This is our home.” This is what people such as Chief Minister Deshmukh and Mukesh Mehta will never understand, Mobin says. “Mukesh Mehta says I am his hero, but what does he know of my life? He is engaged in *shaikhchilli*, which is dreaming, dreaming in the day. Does it occur to him that we do not wish to be part of his dream?”

SUCH SENTIMENTS cause Mukesh Mehta distress. “If someone calls me a dreamer, I plead guilty,” he says, finishing his crème caramel at the Bombay Yacht Club. To be sure, Mehta has made some fanciful statements regarding Dharavi's future. His idea to install a golf driving

“Look at my house,” Mr. Tank demands, showing off his 3,000-square-

(“the post-consumer economy, turning waste into wealth,” he says), had made Mobin a relatively rich man. He and his family live in a marble-floored flat at the 13-floor Diamond Apartments, “Dharavi's number one prestige address.”

Mobin is a supporter of development in Dharavi. Change is necessary. Polluting industries like recycling have no business being in the center of a modern metropolis. Mobin was already making plans to move his factory several miles to the north. But this didn't mean he is happy with what is happening in the place of his birth.

Much of his critique is familiar. The government's failure to create housing for middle-income people was responsible for the existence of the slums, Mobin contends. Many people in Dharavi make enough money to live elsewhere, “a house like you see on TV.” But since no such housing exists, they are doomed to the slum. Mobin doubts Mukesh Mehta's private developers will help. All over Dharavi are reminders of developmental disasters. Near Dharavi Cross Road, members of the L.P.T. Housing Society, their houses torn down in preparation for their promised apartments, have spent the past eight years living in a half-finished building without

range has met with widespread guffaws. “Golf? What is this golf?” asked Shilpiri's crippled father. The other day Mehta was fantasizing about constructing a 120,000-seat cricket stadium in the slum. Asked where fans would park, Mehta looked stricken.

“Parking! Oh, my God,” he exclaimed. “I'm going to be up all night trying to figure that out.”

But being a dreamer doesn't mean he is “unrealistic,” Mehta says. He has been around the block of India's bruising bureaucracy. He has learned hard lessons along the way. One is that “sometimes the last thing people in power want is to get rid of slums.” Much of what Mehta calls “slum perpetuation” has to do with the infamous “vote bank”—a political party, through a deep-rooted system of graft, lays claim to the vote of a particular neighborhood. As long as the slum keeps voting the right way, it's to the party's advantage to keep the community intact. A settlement can remain in the same place for years, shelters passing from makeshift plastic tarps to corrugated metal to concrete. But one day, as in the case of Dharavi, the slum might find itself suddenly in the “wrong” place. Once that happens, the bulldozer is always a potential final

solution. A few years ago, the Maharashtra government, under the direction of Chief Minister Deshmukh, in a spasm of upgrading supposedly aimed at closing the “world-class” gap, demolished 60,000 hutments, some in place for decades. As many as 300,000 people were displaced.

This, Mehta says, is what his plan is devised to avoid. “No one wants to be that unhappy guy driving the bulldozer.” Preferring “the talking cure,” Mehta says if anyone, anywhere, doesn’t think his plan is the best possible outcome for Dharavi, he will sit with them for as long as it takes, to convince them. A few days later, at Kumbharwada, he got his chance.

TO MANY, THE KUMBHAR potters are the heart and soul of Dharavi. Their special status derives not only from their decades-long residence but also from the integrity of their work. While Dha-

foot home and workshop. “Why should we move from here, to there?”

ravi is famous for making use of things everyone throws away, the Kumbhars create the new.

Savdas family members have been Dharavi potters for generations, but Tank Ranchhod Savdas once imagined another kind of life. “I had big dreams,” he says. “I thought I would be a lawyer.” But Tank’s father died in 1986, and “as the oldest son I took up this business.” Not that he has any regrets. “During busy times, I make hundreds of pots a day, and I get pleasure from each one,” he says.

Recently, however, the fortyish “Mr. Tank” has begun to fear for the future of Kumbhars in Dharavi. Increasing numbers of the community’s young men have become merchant seamen, or computer specialists at the Bandra-Kurla Complex. Kumbharwada is full of teenage boys who have never used a potter’s wheel, unthinkable only a few years ago.

And now there is this plan. Just talking about “a slum-free Dharavi” is enough to make Tank shake with anger. How dare anyone claim that Kumbharwada is “a slum” in need of rehabilitation! Kumbharwada is home to working people, men and women who have always made their own way. If Mukesh Mehta was so enamored of

the U.S., couldn’t he see Kumbharwada was a sterling example of the supposed American dream?

“Look at my house,” Tank demands, showing off the 3,000-square-foot home and workshop he built and now shares with his two brothers and their families. “Why should we move from here, to there?”

By “there,” Tank means the Slum Rehabilitation Authority high-rise under construction behind Kumbharwada. Freshly painted, the building has a sprightly look, but soon lack of maintenance will turn it into a replica of every other SRA building: a decaying Stalinist-styled pile, covered with Rorschach-like mildew stains. Inside is a long, dank hallway with 18 apartments on either side, which Amit Singh calls “36 rooms of gloom.”

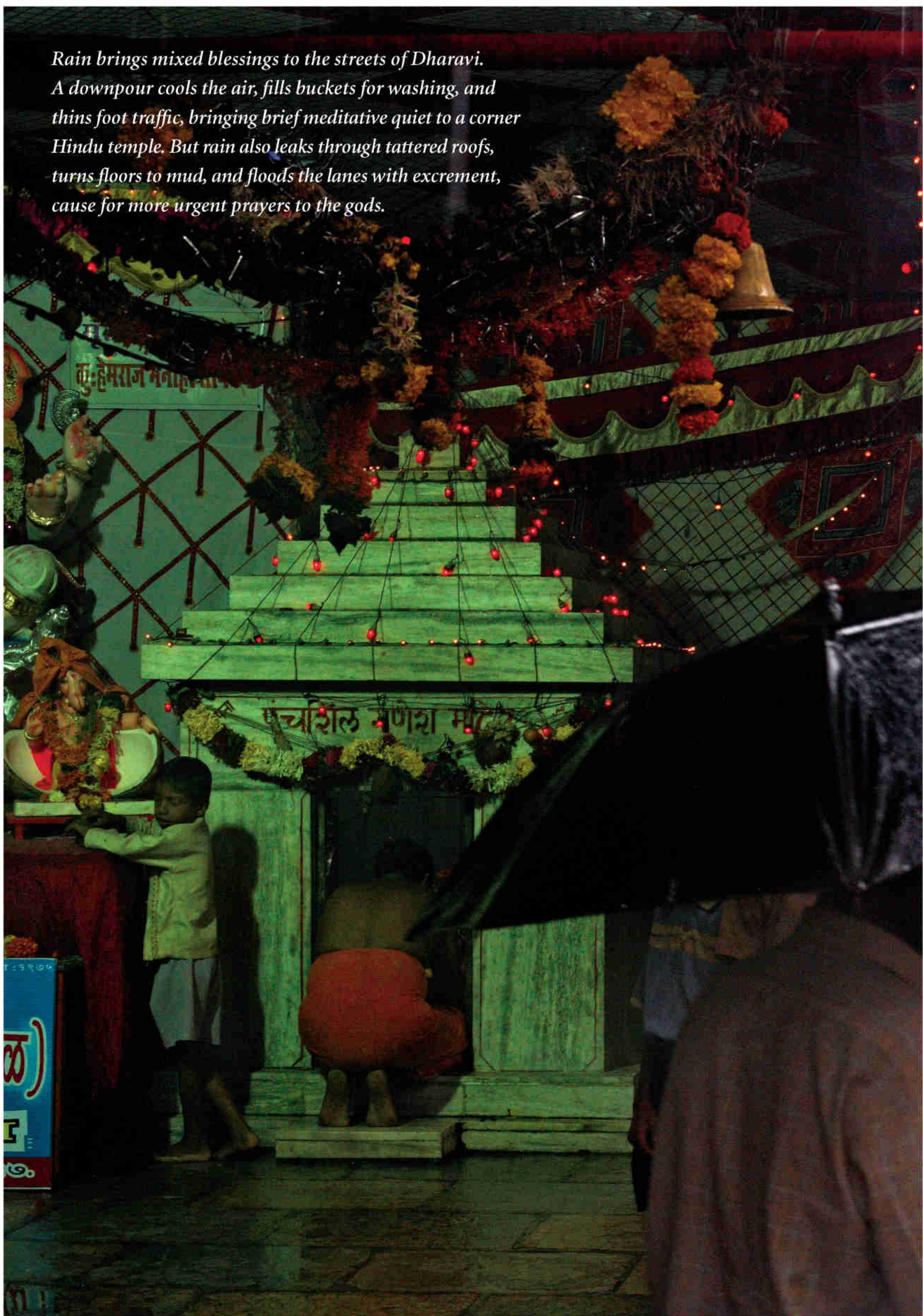
“That is a slum,” says Tank, “a vertical slum.” Told that Mehta says he’s willing to talk with

anyone unhappy with the plan, Tank says, “Then bring him here. Tomorrow.”

On his cell phone from Hyderabad, Mehta, “not risk averse,” says “ten o’clock.” But he is skeptical the meeting will accomplish much. He’s spoken with the potters many times. Proposals allowing them to keep the majority of their space have been rejected, as was his idea to maximize the potters’ profits by adding ornamental ceramics to their traditional vessels and religious objects. “I’ve offered them the moon and been repaid with crushing indifference,” Mehta bemoans. Plus, he never knows which alleged leadership group represents whom. It’s a frustrating situation that one afternoon causes the Americanized Mehta to shout, “Your trouble is you have too many chiefs and not enough Indians!”

Yet when ten o’clock rolls around, there he is, impeccably attired in a tan suit, cuff links gleaming in the sunlight, in the courtyard in front of Tank’s house. Perhaps a hundred people have assembled, sitting on plastic chairs. Most are potters, but there are others, too, such as Amit Singh and several colleagues from the *Janhit Times*. After politely (Continued on page 92)

Rain brings mixed blessings to the streets of Dharavi. A downpour cools the air, fills buckets for washing, and thins foot traffic, bringing brief meditative quiet to a corner Hindu temple. But rain also leaks through tattered roofs, turns floors to mud, and floods the lanes with excrement, cause for more urgent prayers to the gods.







INSIDE FOUR WALLS

Mena Lohar, wife of a carpenter, keeps her one-room home (above) as well-scrubbed and tidy as possible. For a Dharavi resident, this young mother can consider herself lucky to have concrete walls, a cooking stove, and electricity. By contrast, nine-year-old Shraddha Kurmi (below right), whose father works in a garment factory, lives in a shack without power, its walls made of jute bags. Few homes have running





water or toilets, but a household without a television is uncommon in Dharavi. Her enthusiasm undimmed by regular power outages, preschool teacher Monica Naik (above) enthralles 30 children in a space warmed by their drawings in Rajiv Gandhi Nagar, the slum's poorest district where most new migrants settle. Intent game players at the Star Carrom Club (bottom left), a popular hangout in the potters' district, barely notice the stark surroundings.



(Continued from page 87) listening to Mehta's short form of the plan (he has brought his PowerPoint presentation, but sunlight prevents its deployment), the objections begin. It is outrageous that this was even being discussed, people say. "We have been making pots for 130 years," one man shouts. "This land is ours."

Mehta is sympathetic to the Kumbhar position. But there are a few "realities" they must understand. First, the assumption that the community owns the Kumbharwada grounds by virtue of the British Raj-era Vacant Land Tenancy act is incorrect. Mehta says the Kumbhars' long-term lease ran out when the act was repealed in 1974. Also, there is the pollution issue. Every day the potters' brick kilns send huge black clouds into the air. It's gotten so bad that nearby Sion Hospital is complaining that the smoke is aggravating patients' pulmonary ailments.

The Kumbhars are vulnerable on these issues, Mehta says. Chief Minister Deshmukh would be within his rights to send the dreaded bulldozers rolling down 90 Feet Road. The Kumbhars should trust him, Mehta says. His very presence proves his sincerity. "People said if I came here, I should wear a hard hat. But you see me, bareheaded." At the very least, the Kumbhars should allow him to conduct a census of the area. This information would help him fight for them, get them the best deal.

With the return of the late monsoon rains, the session breaks up. Mehta gets back into his chauffeured car feeling upbeat. "A good meeting," he says. The fact that the Kumbhars seemed to agree to the census was a good sign, Mehta says, driving off through puddles.

Back at Kumbharwada, Tank is asked what he has learned from the meeting. Surrounded by perhaps 20 potters, Tank says, "We have learned that Mukesh Mehta's plan is of no use to us." Would they participate in the census? "We'll think about it," says Tank.

In any event, there is no time to talk about it now. The meeting has taken almost two hours. With orders piling up, there is work to be done.

MUKESH MEHTA'S PLAN is scheduled to be implemented sometime this year, not that Dharavi



A barefoot child finds enchantment in a string

is excessively fixated on it during holiday season, a time to, as a sign in the window of Jayanthian fireworks store on 90 Feet Road says, "enjoy the festivals with an atom bomb." Today is Ganesh Chaturthi, and much of Dharavi (the Hindus, anyway) are in the streets beating giant drums and blaring Bollywood-inflected songs on car-battery-powered speakers in celebration of Lord Ganesh. Ganesh, the roly-poly elephant god, has special significance in Dharavi, being considered the deity of "removing obstacles."



of lights hung for a wedding, a grace note of survival in Mumbai's die-hard slum.

One such obstacle is in evidence at the outset of the parade marking the end of the ten-day festival for which people make giant *murtis*, or likenesses, of the god. These effigies are borne through the streets to Mahim Beach and then tossed into the water. One group has constructed a ten-foot-high Ganesh from silvery papier-mâché. They have not, however, bothered to measure the narrow lane through which the Ganesh will need to pass to reach Dharavi Main Road. After much discussion and a tortuous 50-foot journey during which many Dharavian

“obstacles,” including a ganglia of illegally connected electric wires, needed to be removed, the murti makes it through with a quarter inch to spare. Not a bit of the god’s silvery skin is nicked.

As the Ganesh is lifted onto a flatbed truck for its journey to Mahim Beach, one resident turns and says, “You see. The Ganesh is undamaged. This is our talent. We deal with what is.” □

👉 **Urban Unbalance** Does development in slum communities push out the poor? Share your thoughts in our forum at ngm.com/0705.



A herd of hippos is gathered in a river at dusk. The water is a deep blue, and the hippos are dark silhouettes against the lighter sky. One hippo in the center has a small red light reflecting off its eye. The hippos are scattered throughout the frame, some partially submerged, some with their heads above water.

waiting for thunder

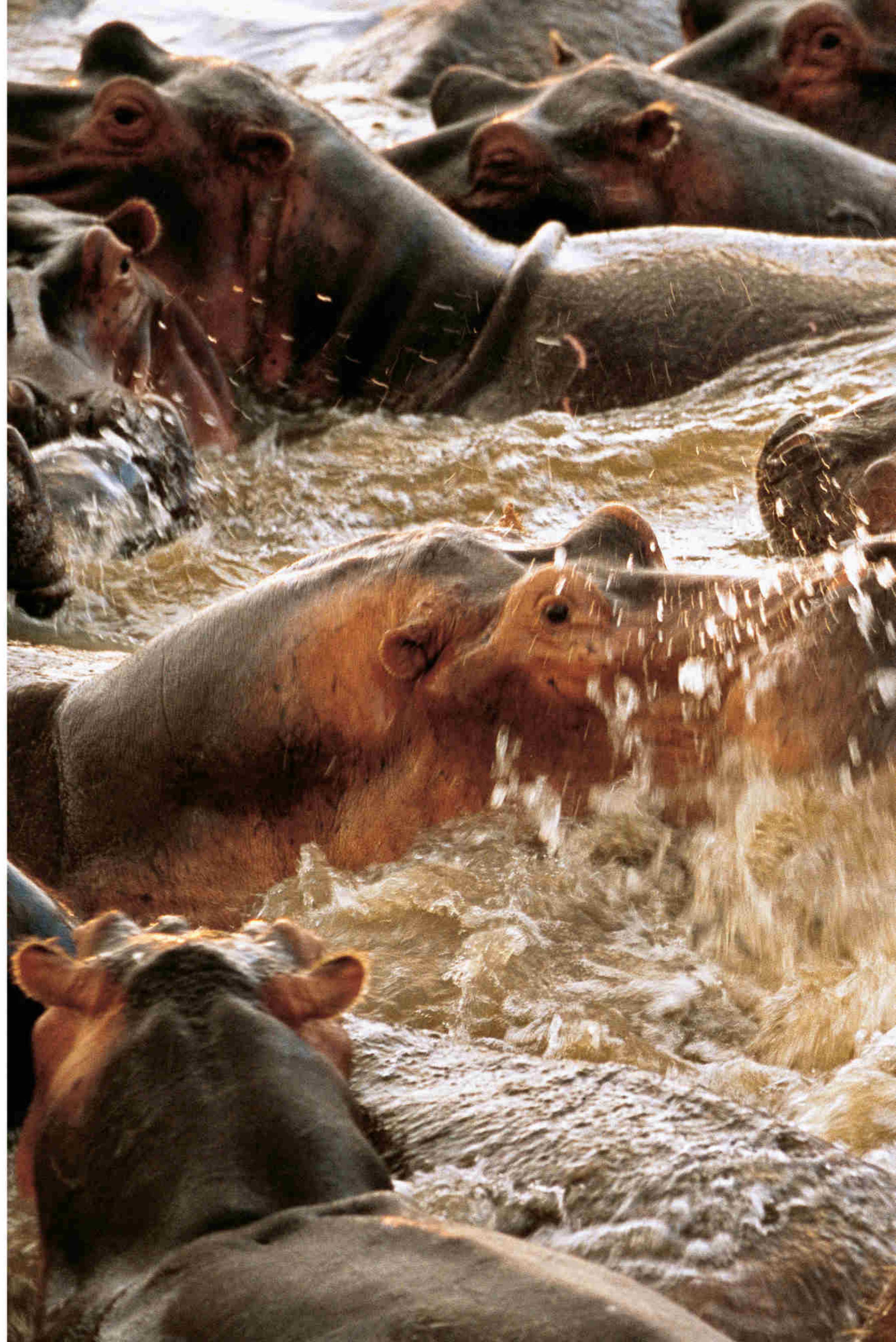
In Zambia's Luangwa Valley,
rain and river create
a wildlife stronghold.







The largest concentration of hippos in Africa lives in the Luangwa Valley, one of the continent's great sanctuaries for wildlife. At the end of the dry season, hippos pack channels and shrinking pools in the Luangwa River (preceding pages), overcrowding that often causes tempers to flare (right). Drying lagoons mean easier fishing for a yellow-billed stork probing for catfish (above).







The first downpour after six dry months marks the annual transformation of a land kept wild by extreme seasonal swings. Heavy rains and the overflowing Luangwa River flood this sparsely populated valley, isolating the region for half the year and reviving its habitats for wildlife.



By Christine Eckstrom
Photographs by Frans Lanting

The Luangwa, one of the last major unaltered rivers in southern Africa, is the lifeline—and protector—of the valley it threads. Hippos, elephants, giraffes, lions, leopards, buffalo, and scores of other species flourish in the 20,000 square miles of savanna-woodland watered by this 500-mile-long river. It is people that have been scarce here, especially beyond the town of Mfuwe. One reason is the Luangwa's annual flood cycle. Each year during the rains, the river reinvents the land. Swelling from a knee-deep stream to a roiling brown torrent, it carves new channels and spills into surrounding plains and woodlands, making this broad valley in eastern Zambia impassable by road for nearly half the year. For the other half, the waters retreat, leaving behind a rejuvenated landscape, which slowly parches through the long dry months that follow, when

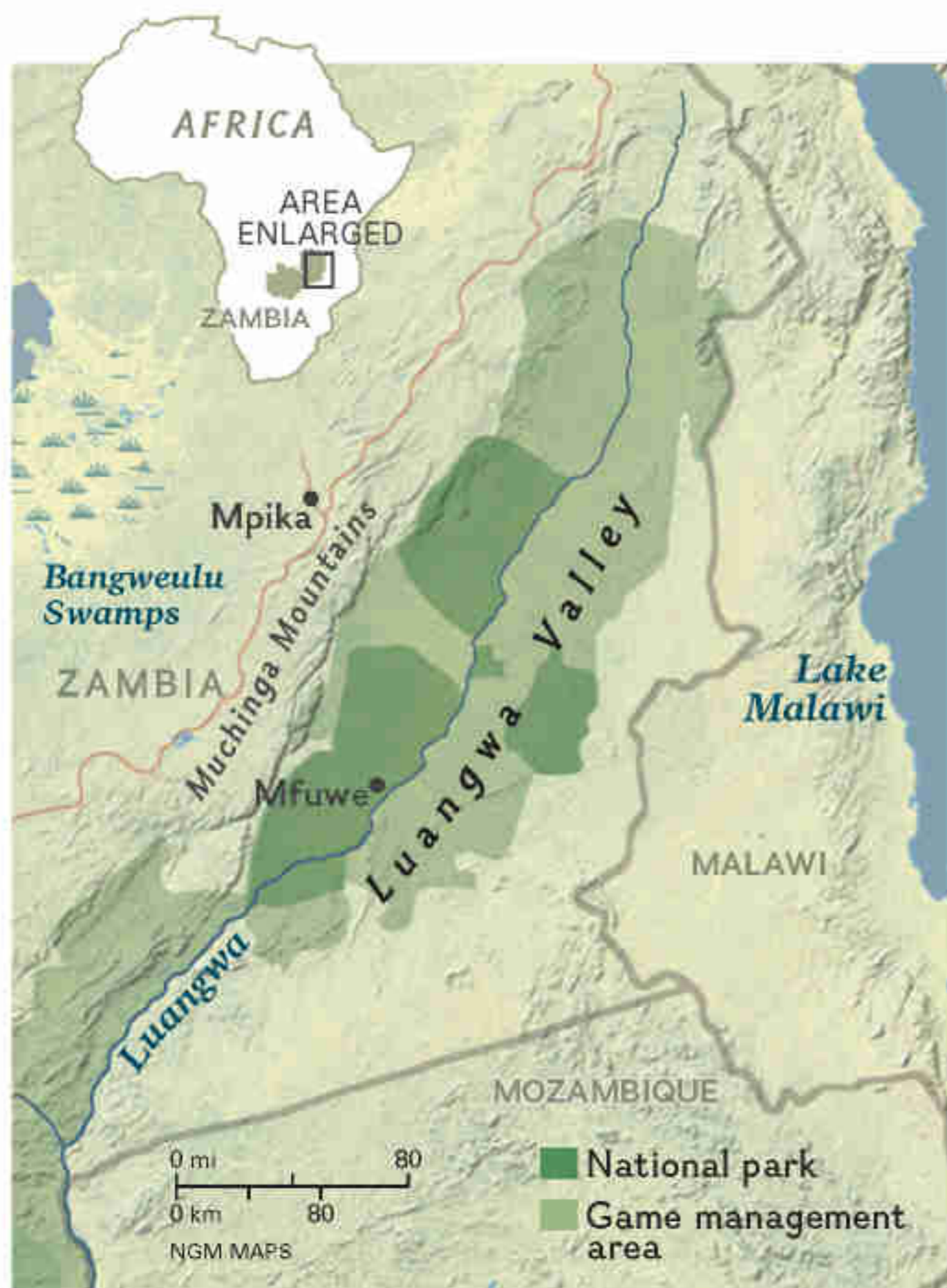
temperatures steadily climb until the land throbs with heat and thirst.

By late October, the floodplains are grazed to stubble, and a hot wind spins dust devils in the powdery soil. At dusk, hippos leave the river's last deep pools and melt into the darkness of the bush to forage. Some walk for miles to find food, and many die in this season of stress. One morning a small dead hippo floats by. Female hippos approach and nuzzle it, licking its skin, then moving away.

The seasons can be hard on the valley's wildlife, but people have been harder still. Hunting and poaching, even within the national parks, have drastically reduced hippo and elephant populations in the past, yet both have made a comeback, thanks in part to changes in enforcement and attitude. The resurgence is a sign of human tolerance and nature's resilience.

In November thunderheads build, bruised and dark, and the sky rumbles all night. One afternoon the earthy aroma of an approaching downpour blows in on a hard wind, and a cool gray curtain of rain sweeps the land, beating down in a torrent, rinsing dust from grasses and trees. Almost overnight, green shoots poke up from the earth. Bare mopani woodlands shimmer pink with new leaves. Lemon yellow blooms pop from acacias, and fragile spider lilies spring up in white drifts on the plains. Elephants and buffalo disperse into the uplands, where the browse is fresh. Impalas give birth, and zebras materialize from the bush with tiny foals.

Within days of the first rain, Abdim's storks appear overhead, wheeling in great gyres of thousands of birds. They are migrating south, and some Africans know them as bringers of rain. They touch down in a bobbing mass, moving together through the grass in a broad front, like fire, finding frogs and insects brought forth by the water. A new season is here.

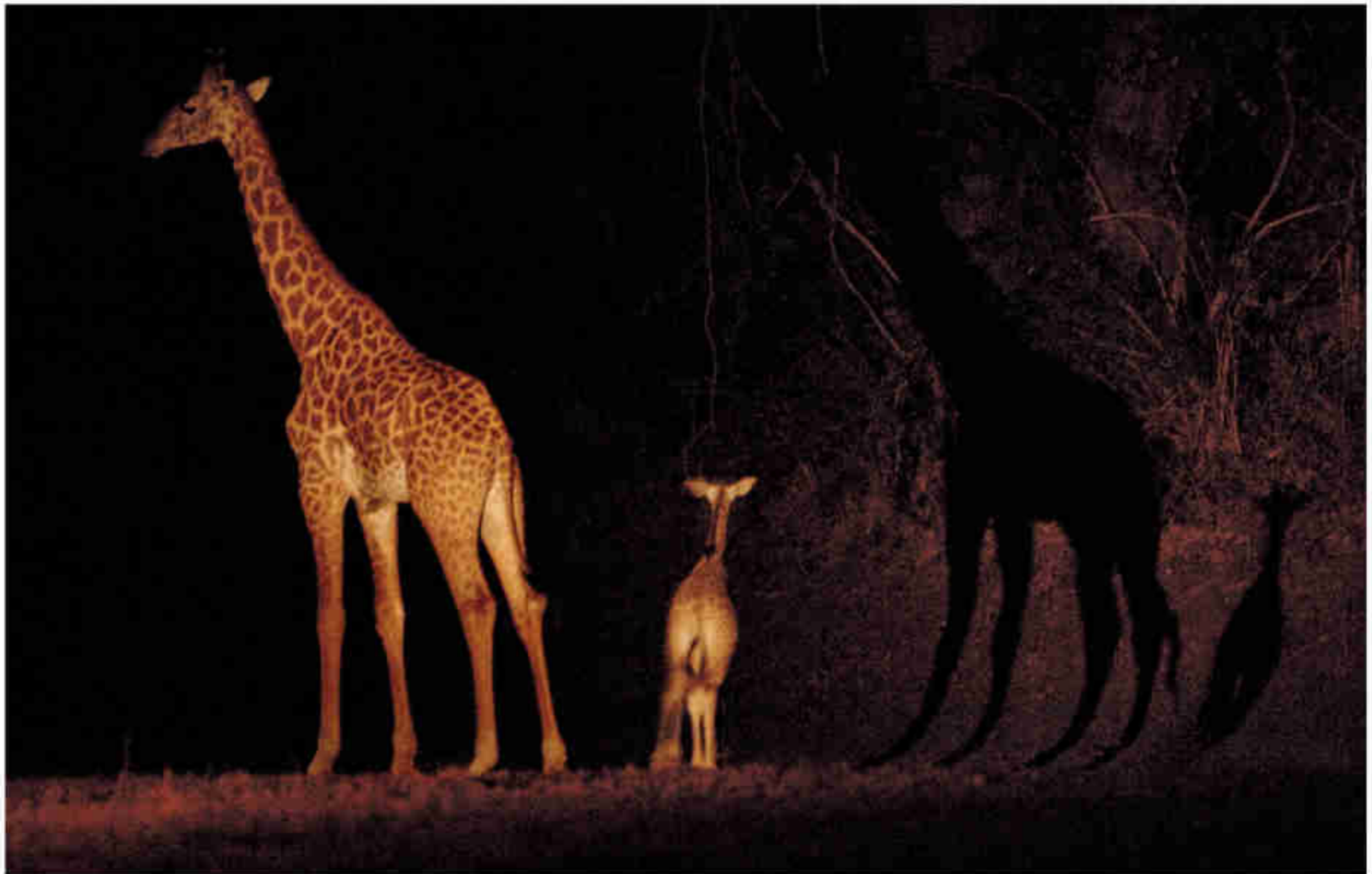




Shading her eye with an ear, an elephant rests lying down, a sign that she feels safe. Once called the Valley of Elephants, Luangwa (map) suffered a poaching onslaught during the 1970s and '80s, when nearly 100,000 animals were killed. Today they number perhaps 10,000 and are generally holding their own. In a few game management areas outside the parks, trophy hunting resumed in 2005, raising fears that the last few mature bulls in the valley could be shot.



Answering a rival's roar, a male lion defends his turf and his pride, who rest nearby. One evening the two males stood on opposite shorelines of the river and thundered back and forth, keeping all animals within earshot alert. Below, as a female giraffe leads her newborn calf through the night, a spotlight casts the animals' shadows against the bank of a lagoon. In the first weeks after birth, giraffe mothers try to hide their young in dense cover to protect them from lions.

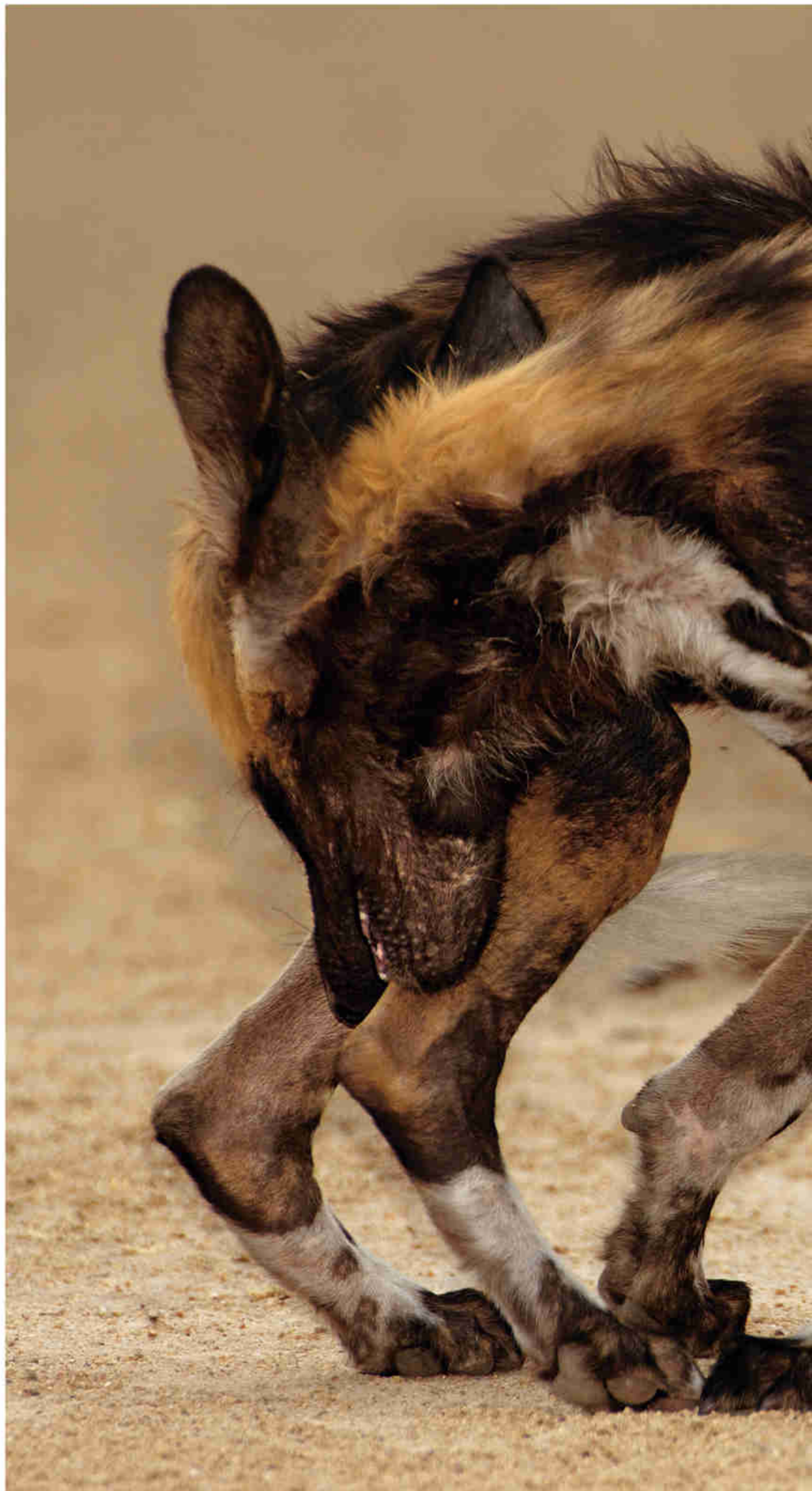






Carmine bee-eaters take a break during insect-hunting forays in nearby grasslands. Thousands of the birds migrate to the valley in August, burrowing nest holes into riverbanks. Chicks begin to peer from the holes early in the rainy season. They must fledge before the river rises and floods the banks.

Play is serious business for young wild dogs. Their biting antics help them learn social cues they will use as adults to survive within the hierarchy of the pack. Where wild dogs spend the dry season remains a mystery, which makes their rare appearances after the rains begin all the more captivating.





Just after dawn,
a warthog emerges
from one of many
burrows she uses
to escape predators
and rear young.







Watery trails made by hippos lead to a drying oxbow lagoon (left). With their semiaquatic lifestyle, these mammals connect land and river and nourish both with their nutrient-rich dung. In the early 1900s, hide hunters nearly wiped out Luangwa's hippos, but after decades of protection the valley is now home to 19,000. A growing human population is coming into conflict with elephants, especially in the dry season, when the animals (below) cross the river at twilight to feed on the other side, sometimes in village croplands. As elephant and human interactions increase, so does the need for a respectful coexistence in a valley still big enough and wild enough for both. □

👉 **Wild Things** Watch crocodiles fighting over a hippo carcass, and elephants parading through a hotel lobby in a video production at ngm.com/0705.



BY CHARLES BOWDEN

PHOTOGRAPHS BY
DIANE COOK AND LEN JENSHEL

A WALL ALONG THE U.S.-MEXICO
BORDER PROMPTS DIVIDED FEELINGS:
IT OFFENDS PEOPLE. IT COMFORTS
PEOPLE. AND IT KEEPS EXPANDING.

Our Wall



TIJUANA, MEXICO

A stark cross hangs at the border for an unknown migrant who sought prosperity in the U.S. but died in the crossing.



**ORGAN PIPE
CACTUS NATIONAL
MONUMENT,
ARIZONA**

Barricades like those that bristled off Normandy beaches on D-Day now guard desert. They stop smugglers of drugs and migrants from driving across the border but let the endangered Sonoran pronghorn pass. Allusions to war are apt: In 2002, before the barriers were in place, drug cartel gunmen killed a U.S. park ranger here.





In the spring of 1929, a man named Patrick Murphy left a

bar in Bisbee, Arizona, to bomb the Mexican border town of Naco, a bunny hop of about ten miles. He stuffed dynamite, scrap iron, nails, and bolts into suitcases and dropped the weapons off the side of his crop duster as part of a deal with Mexican rebels battling for control of Naco, Sonora. When his flight ended, it turned out he'd hit the wrong Naco, managing to destroy property mainly on the U.S. side, including a garage and a local mining company. Some say he was drunk, some say he was sober, but everyone agrees he was one of the first people to bomb the United States from the air.

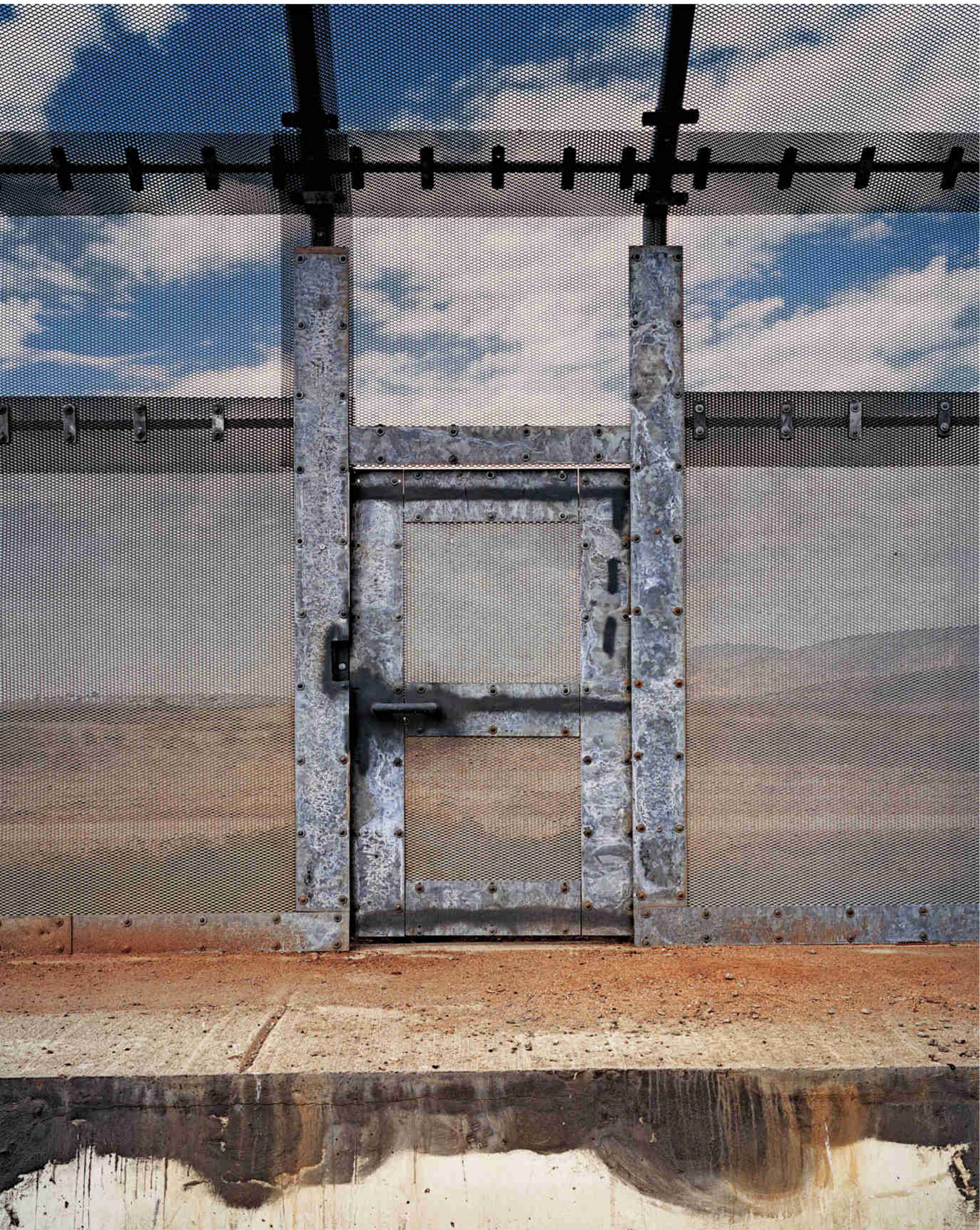
Borders everywhere attract violence, violence prompts fences, and eventually fences can mutate into walls. Then everyone pays attention because a wall turns a legal distinction into a visual slap in the face. We seem to love walls, but are embarrassed by them because they say something unpleasant about the neighbors—and us. They flow from two sources: fear and the desire for control. Just as our houses have doors and locks, so do borders call forth garrisons, customs officials, and, now and then, big walls. They give us divided feelings because we do not like to admit we need them.

Now as the United States debates fortifying its border with Mexico, walls have a new vogue. At various spots along the dusty, 1,952-mile boundary, fences, walls, and vehicle barriers have been constructed since the 1990s to slow the surge in illegal immigration. In San Diego, nine miles of a double-layered fence have been erected. In Arizona, the state most overrun with illegal crossings, 65 miles of barriers have been constructed already. Depending on the direction of the ongoing immigration debate, there may soon be hundreds more miles of walls.

The 800 or so residents of Naco, Arizona, where Patrick Murphy is part of the local lore, have been living in the shadow of a 14-foot-high steel wall for the past decade. National Guard units are helping to extend the 4.6-mile barrier 25 miles deeper into the desert. The Border Patrol station is the biggest building in the tiny town; the copper roof glistens under the blistering sun. In 2005, a pioneering bit of guerrilla theater took place here when the Minutemen, a citizen group devoted to securing the border, staked out 20 miles of the line and patrolled it. Today about 8,000 people live in Naco, Sonora, on the Mexican side of the metal wall that slashes the two communities.

Only a dirt parking lot separates the Gay 90s bar from the Naco wall. Inside, the patrons are largely bilingual and have family ties on both sides of the line. Janet Warner, one of the bartenders, has lived here for years and is one of those fortunate souls who has found her place in the sun. But thanks

OTAY MESA, CALIFORNIA The hills of California appear dreamlike beyond a section of steel mesh wall with a door that opens only for Border Patrol agents.





to the racks of stadium lights along the wall, she has lost her nights, and laments the erasure of the brilliant stars that once hung over her life. She notes that sometimes Mexicans jump the new steel wall, come in for a beer, then jump back into Mexico. The bar began in the late 1920s as a casino and with the end of Prohibition added alcohol. The gambling continued until 1961, when a new county sheriff decided to clean up things. On the back wall are photographs of Ronald and Nancy Reagan when they'd stop by on their way to a nearby Mexican ranch.

The bar is one of only a handful of businesses left. The commercial street leading to the border is lined with defunct establishments, all dead because the U.S. government sealed the entry to Mexico after 9/11 and rerouted it to the east. Leonel Urcadez, 54, a handsome man who has owned the bar for decades, has mixed feelings about the wall. "You get used to it," he says. "When they first built it, it was not a bad idea—cars were crossing illegally from Mexico and the Border Patrol would chase them. But it's so ugly."

The two Nacos came into being in 1897 around a border crossing that connected copper mines in both nations. By 1901 a railroad linked the mines. A big miners' strike in 1906, one cherished by Mexicans as foreshadowing the revolution in 1910, saw troops from both nations facing each other down at the line. The town of Naco on the Mexican side changed hands many times during the actual revolution—at first the prize was revenue from the customs house. Later, when Arizona voted itself dry in 1915, the income came from the saloons. Almost every old house in Naco, Arizona, has holes from the gun battles. The Naco Hotel, with its three-foot mud walls, advertised its bulletproof rooms.

The boundary between Mexico and the United States has always been zealously insisted upon by both countries. But initially Mexicans moved north at will. The U.S. patrols of the border that began in 1904 were mainly to keep out illegal Asian immigrants. Almost 900,000 Mexicans legally entered the United States to flee the violence of the revolution. Low population in both nations and the need for labor in the American Southwest made this migration a non-event for decades. The flow of illegal immigrants exploded after the passage of the North American Free Trade Agreement in the early 1990s, a pact that was supposed to end illegal immigration but wound up dislocating millions of Mexican peasant farmers and many small industrial workers.

The result: Naco was overrun by immigrants on their way north. At night, dozens, sometimes hundreds, of immigrants would crowd into motel rooms and storage rental sheds along the highway. The local desert was stomped



A 2006 law authorized more than 700 miles of new barriers along the 1,952-mile border. But construction funding remains uncertain.

into a powder of dust. Naco residents found their homes broken into by desperate migrants. Then came the wall in 1996, and the flow of people spread into the high desert outside the town.

The Border Patrol credits the wall, along with better surveillance technology, with cutting the number of illegal immigrants captured near Naco's 33-mile border by half in the past year. Before this new heightening of enforcement, the number caught each week, hiding in arroyos thick with mesquite and yucca, often exceeded the town's population. At the moment, the area is relatively quiet as "coyotes," or people smugglers, pause to feel out the new reality, and the National Guard has been sent in to assist the Border Patrol. At the nearby abandoned U.S. Army camp, the roofs are collapsing and the adobe bricks dribble mud onto the floor. Scattered about are Mexican water bottles—illegals still hole up here after climbing the wall.

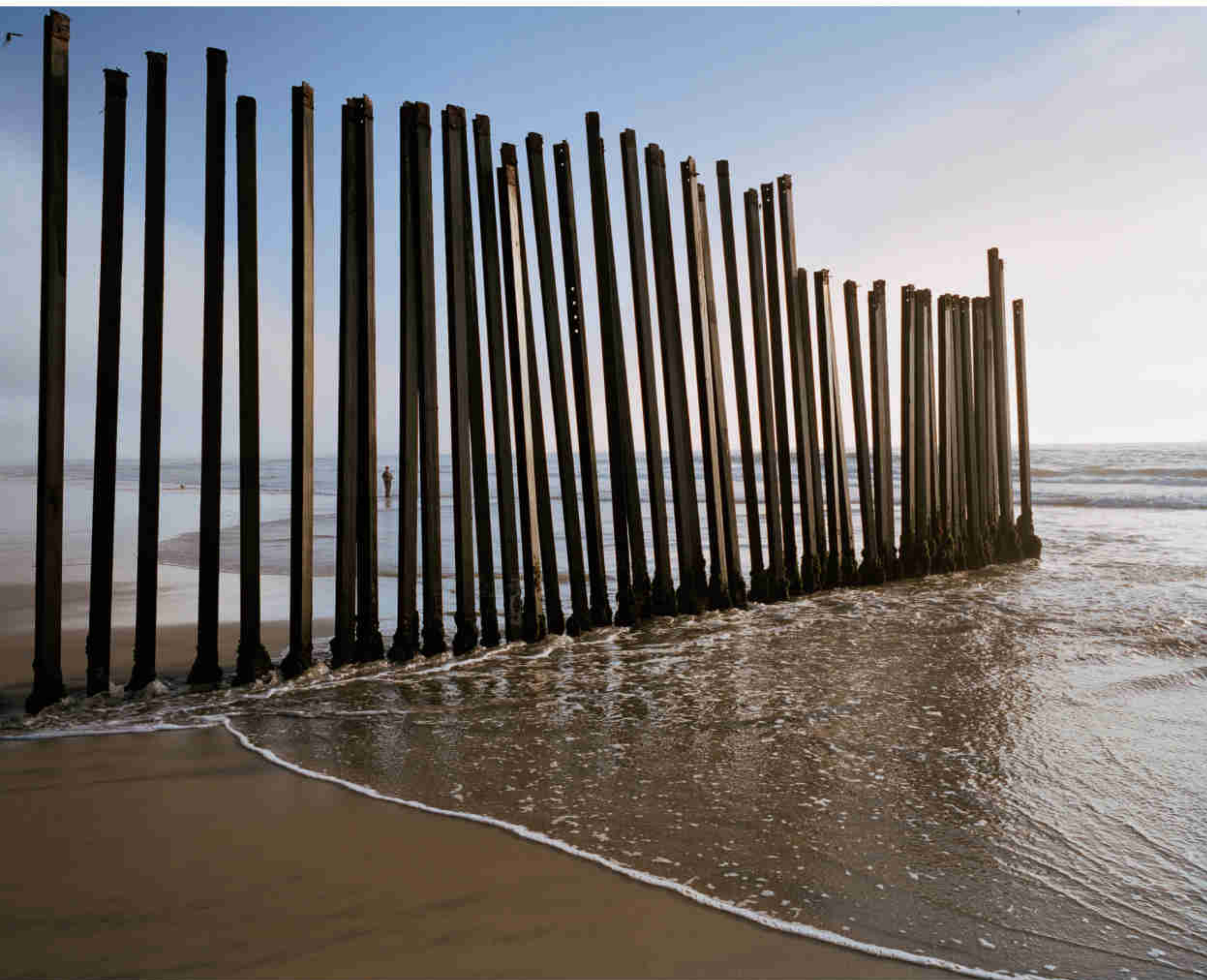
Residents register a hodgepodge of feelings about the wall. Even those who have let passing illegal immigrants use their phones or given them a ride say the exodus has to stop. And even those sick of finding trash in their yards understand why the immigrants keep coming.

"Sometimes I feel sorry for the Mexicans," says Bryan Tomlinson, 45, a custodial engineer for the Bisbee school district. His brother Don chimes in, "But the wall's a good thing."

A border wall seems to violate a deep sense of identity most Americans cherish. We see ourselves as a nation of immigrants with our own goddess, the Statue of Liberty, a symbol so potent that dissident Chinese students fabricated a version of it in 1989 in Tiananmen Square as the visual representation of their yearning for freedom.

Walls are curious statements of human needs. Sometimes they are built to keep restive populations from fleeing. The Berlin Wall was designed to keep citizens from escaping from communist East Germany. But most walls are for keeping people out. They all work for a while, until human appetites or sheer numbers overwhelm them. The Great Wall of China, built mostly after the mid-14th century, kept northern tribes at bay until the Manchu conquered China in the 17th century. Hadrian's Wall, standing about 15 feet high, 9 feet wide, and 73 miles long, kept the crazed tribes of what is now Scotland from running amok in Roman Britain—from A.D. 122 until it was overrun in 367. Then you have the Maginot Line, a series of connected forts built by France after World War I to keep the German army from invading. It was a success, except for one flaw: The troops of the Third Reich simply went around its

(Continued on page 136)



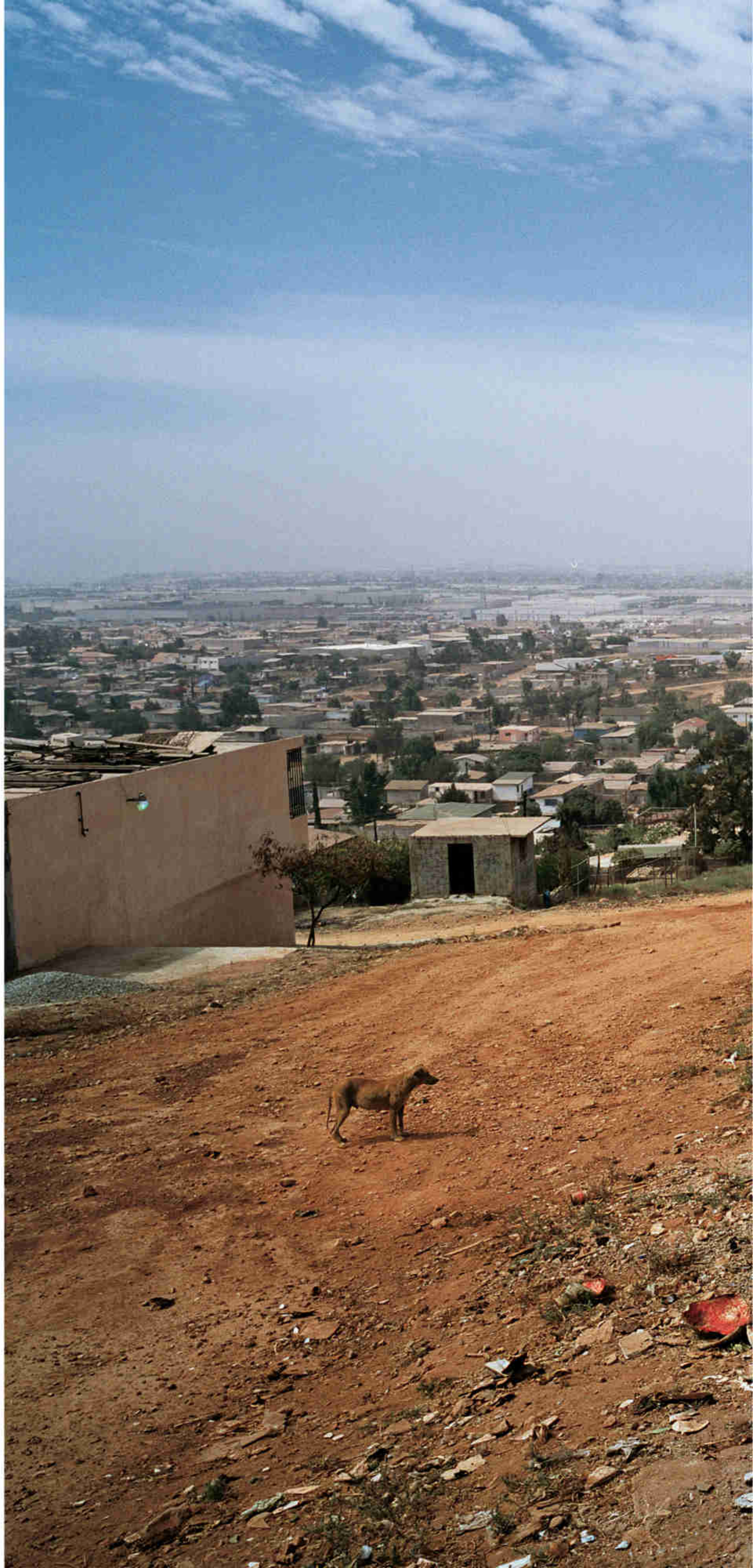
BORDER FIELD STATE PARK AND SAN DIEGO, CALIFORNIA

A surreal hedge of upended railway tracks (above), easily penetrated or bypassed by immigrants willing to get their feet wet, marks the western extent of the U.S.-Mexico border. But just to the east, a metal wall and a concrete fence impassively bar illegal entry in a floodlit no-man's-land where Border Patrol agents keep close watch.



SOMETIMES WALLS ARE BUILT TO
KEEP A RESTIVE POPULATION FROM FLEEING.
BUT MOST WALLS ARE FOR KEEPING PEOPLE OUT.

TIJUANA, MEXICO
An improvised wall of military surplus steel cuts a rusty slash toward the horizon. In Tijuana, where poverty is rising and half of all new residents live in squatter communities without clean water, the wall is hard to ignore: Houses push up close to the border. On the U.S. side, development is far removed from the barrier.









**CALEXICO,
CALIFORNIA**

The grass is dying and the shade trees collapsing, but security lights are in full bloom on a former golf course now used for policing the border. Ironically, say some immigration experts, the increasing lockdown can backfire, frightening migrants from attempting the journey home and thus lengthening their stays in the U.S.



**WE SEEM TO LOVE WALLS, BUT ARE
EMBARRASSED BY THEM. THEY SAY SOMETHING
UNPLEASANT ABOUT THE NEIGHBORS—AND ABOUT US.**



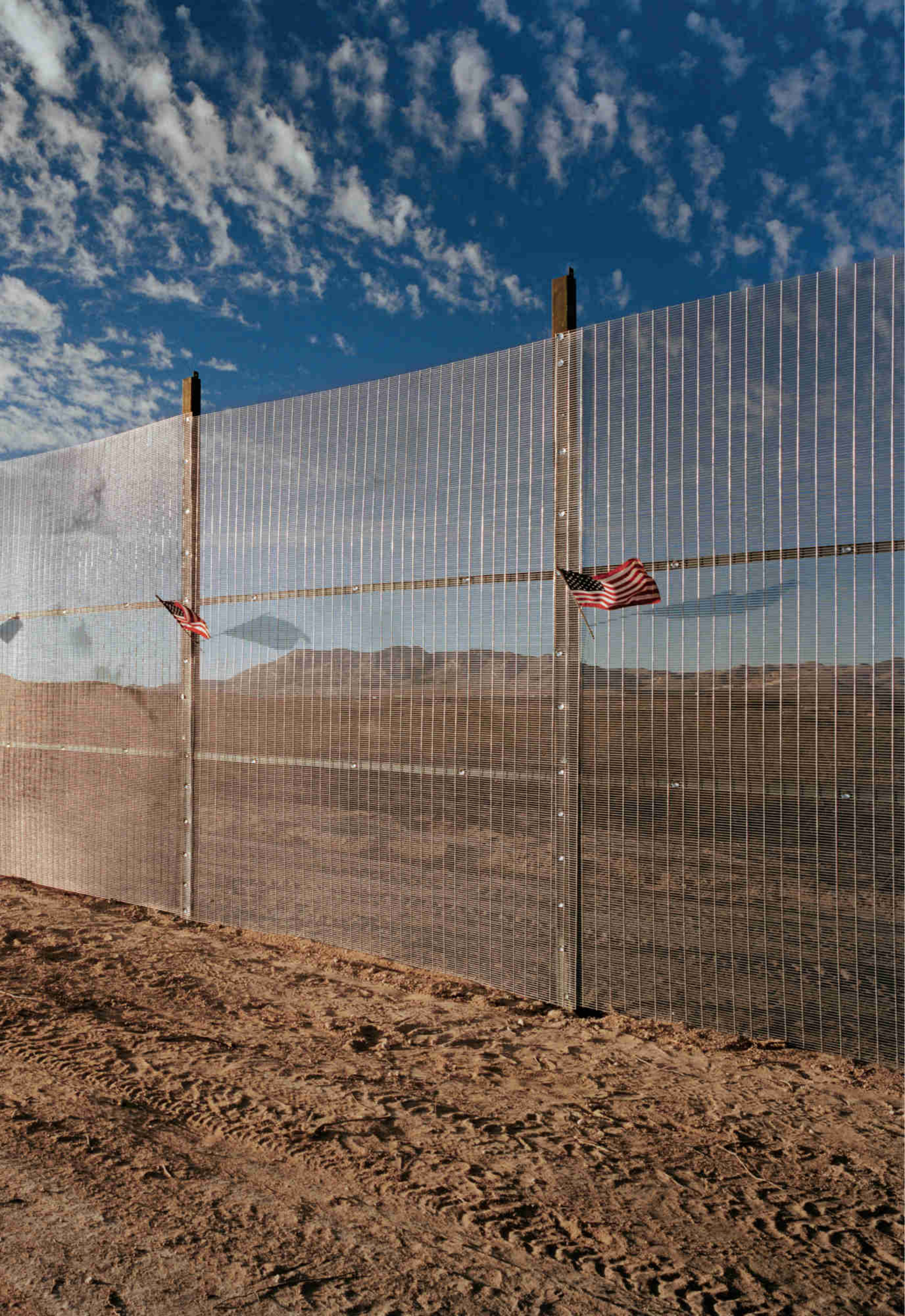
ANDRADE, CALIFORNIA AND SAN LUIS, ARIZONA

The border wall winds through moonscape (left), following the demands of terrain rather than the political boundary that lies several hundred yards south. On the Arizona side of a vehicle barrier (above), Border Patrol agents have smoothed the sand with old tires so they can “cut sign”—track the footprints of migrants tempting fate on this remote desert route.

NACO, ARIZONA

Old Glory juts toward the Mexican border as if in warning. Unlike most barriers on the border, the nearly mile-long fence on a local rancher's land was built not by the U.S. government but by a private group, the Minuteman Civil Defense Corps, which opposes the influx of illegal immigrants. The group promises that if the government doesn't seal the border, it will.









**AGUA PRIETA,
MEXICO**

Eyes on the border stare into Mexico. "He saw you," is what Mexican-American artist Alfred Quiroz titled the giant *milagro*—a traditional amulet for health—bolted to the fence near a major port of entry. The border, where each year a million people are captured and hundreds die trying to sneak north, desperately needs healing, says Quiroz.

(Continued from page 123) northwestern end and invaded France through the Netherlands and Belgium. Now tourists visit its labyrinth of tunnels and underground barracks.

In 1859 a rancher named Thomas Austin released 24 rabbits in Australia because, he noted, “the introduction of a few rabbits could do little harm and might provide a touch of home, in addition to a spot of hunting.” By that simple act, he launched one of the most extensive barriers ever erected by human beings: the rabbit fences of Australia, which eventually reached 2,023 miles. Within 35 years, the rabbits had overrun the continent, a place lacking sufficient and dedicated rabbit predators. For a century and a half, the Australian government has tried various solutions: imported fleas, poisons, trappers. Nothing has dented the new immigrants. The fences themselves failed almost instantly—rabbits expanded faster than the barriers could be built, careless people left gates open, holes appeared, and, of course, the rabbits simply dug under them.

In Naco all the walls of the world are present in one compact bundle. You have Hadrian’s Wall or the Great Wall of China because the barrier is intended to keep people out. You have the Maginot Line because a 15-minute walk takes you to the end of the existing steel wall. You have the rabbit fences of Australia because people still come north illegally, as do the drugs.

Perhaps the closest thing to the wall going up on the U.S.-Mexico border is the separation wall being built by Israel in the West Bank. Like the new American wall, it is designed to control the movement of people, but it faces the problem of all walls—rockets can go over it, tunnels can go under it. It offends people, it comforts people, it fails to deliver security. And it keeps expanding.

Rodolfo Santos Esquer puts out *El Mirador*, a weekly newspaper in Naco, Sonora, and he finds the wall hateful. He stands in his cramped office—a space he shares with a small shop peddling underwear—and says, “It looks like the Berlin Wall. It is horrible. It is ugly. You feel more racism now. It is a racist wall. If people get close to the wall, the Border Patrol calls the Mexican police, and they go and question people.”

And then he lightens up because he is a sunny man, and he says it actually hasn’t changed his life or the lives of most people in town. Except that the coyotes now drive to the end of the wall before crossing. And as the wall grows in length, the coyotes raise their rates. Santos figures half the town is living off migrants going north—either feeding them and housing them or guiding them into the U.S. Passage to Phoenix, about 200 miles away, is now \$1,500 and rising. He notes that after the wall went up in 1996, the migration mushroomed. He wonders if there is a connection, if the wall magically beckons migrants. Besides, he says, people just climb over it with ropes.

Santos fires up his computer and shows an image he snapped in the

THERE IS A LAW ON THE BORDER: THE CLOSER YOU GET TO THE LINE, THE MORE RATIONAL YOU BECOME, BECAUSE EVERYONE HAS TIES TO PEOPLE ON THE OTHER SIDE.

cemetery of a nearby town. There, there, he points as he enlarges a section of the photo. Slowly a skull-shaped blur floats into view against the black of the night—a ghost, he believes. The border is haunted by ghosts—the hundreds who die each year from heat and cold, the ones killed in car wrecks as the packed vans of migrants flee the Border Patrol, and the increasing violence erupting between smugglers and the agents of Homeland Security. Whenever heat is applied to one part of the border, the migration simply moves to another part. The walls in southern California drove immigrants into the Arizona desert and, in some cases, to their deaths. We think of walls as statements of foreign policy, and we forget the intricate lives of the people we wall in and out.

Emanuel Castillo Erúnez, 23, takes crime and car wreck photos for *El Mirador*. He went north illegally when he was 17, walked a few days, then was picked up and returned to Mexico. He sits on a bench in the plaza, shielded by a New York Yankees cap, and sums up the local feeling about the wall simply: “Some are fine with it, some are not.” He thinks of going north again, but then he thinks of getting caught again. And so he waits.

There is a small-town languor about Naco, Sonora, and the wall becomes unnoticeable in this calm. The Minutemen and National Guard terrify people. At the Hospedaje Santa María, four people wait for a chance to go over the wall and illegally enter the wealth of the United States. It is a run-down, two-story building, one of many boarding houses for migrants in Naco. Salvador Rivera, a solid man in his early 30s, has been here about a year. He worked in Washington State, but, when his mother fell ill, he returned home to Nayarit, Mexico, and is now having trouble getting past the increased security. He left behind an American girlfriend he can no longer reach.

“For so many years, we Mexicans have gone to the U.S. to work. I don’t understand why they put up a wall to turn us away. It’s not like we’re robbing anybody over there, and they don’t pay us very much.”

But talk of the wall almost has to be prompted. Except for those engaged in smuggling drugs or people, border crossers in Naco, Sonora, continue to enter through the main gate, as they always have. They visit relatives on the other side, as they always have. What has changed is this physical statement, a big wall lined with bright lights, that says, yes, we are two nations.

Jesús Gastelum Ramírez lives next door to the wall, makes neon signs, and looks like Willie Nelson. He watches people climb the wall and he understands a reality forgotten by most U.S. lawmakers—that simply to go through the wire instantly raises a person’s income tenfold. Gastelum knows many of his neighbors smuggle people, and he understands.

Until recently, a volleyball team from the Mexican Naco and a team from the U.S. Naco used to meet once a year at the point where the wall ends on the west side of town, put up a net on the line, bring kegs of beer, and play a volleyball game. People from both Nacos would stream out to the site

and watch. And then the wall would no longer exist for a spell. But it always confronts the eye.

Dan Duley, 50, operates heavy equipment and is a native of the Naco area. He was living in Germany after serving in the Air Force when the Berlin Wall came down, and he thought that was a fine thing. But here he figures something has to be done. "We need help," he says. "We're being invaded. They've taken away our jobs, our security. I'm just a blue-collar man living in a small town. And I just wish the government cared about a man who was blue."

But then, as in many conversations on the border, the rhetoric calms down. Duley, along with many other Naco residents, believes the real solution has to be economic, that jobs must be created in Mexico. There is an iron law on this border: The closer one gets to the line, the more rational the talk becomes because everyone has personal ties to people on the other side. Everyone realizes the wall is a police solution to an economic problem. The Mexicans will go over it, under it, or try to tear holes in it. Or, as is often the case, enter legally with temporary visiting papers and then melt into American communities. Of the millions of illegal immigrants living in the United States, few would have come if there wasn't a job waiting for them.

Over in Naco, Sonora, the final night of a fiesta is in full roar. Men drinking beer move by on horseback, groups of girls in high heels prance past. Nearby, folks play bingo, and in the band shell a group does a sound check for the big dance. Looming over the whole party is a giant statue of Father Hidalgo with his bald head and wild eyes. He launched the Mexican Wars of Independence in 1810. Two blocks away, the steel wall glows under a battery of lights.

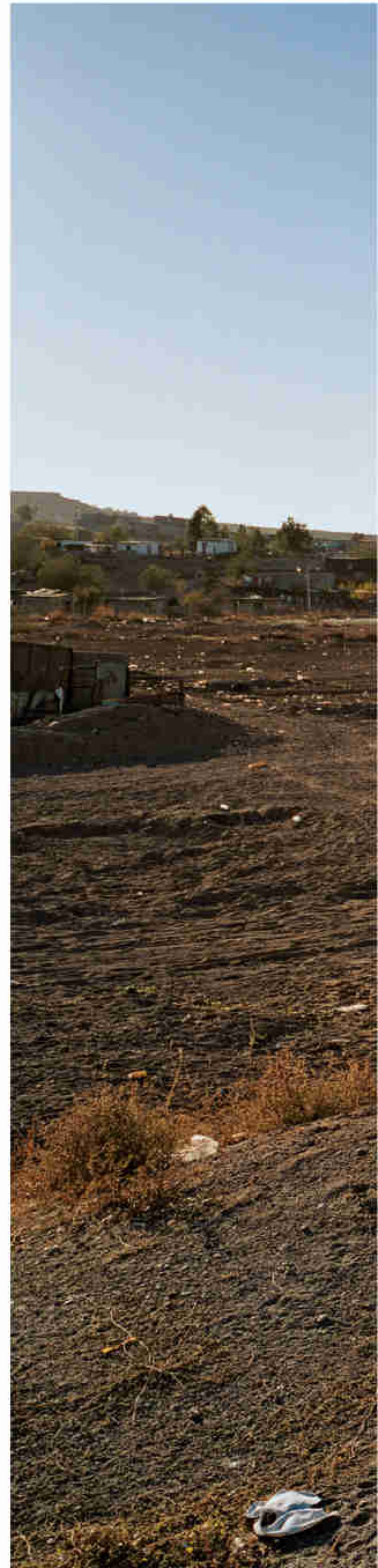
In the Gay 90s bar in Naco, Arizona, a *quinceañera*, the 15th-birthday celebration that introduces a young girl to the world, is firing up. There are 200 people in the saloon's back room, half from Mexico and half from the U.S. The boys wear rented tuxedo vests, the girls are dressed like goddesses. One man walks in with a baby in a black polka-dot dress with pink trim.

The birthday girl, Alyssa, stands with her family for an official portrait.

Walls come and go, but quinceañeras are forever, I say to the man with the baby. He nods his head and smiles.

The steel barrier is maybe a hundred feet away. Outside in the darkness, Mexicans are moving north, and Border Patrol agents are hunting them down. Tomorrow, work will continue on the construction of the wall as it slowly creeps east and west from the town. Tourists already come to look at it.

I have no doubt someday archaeologists will do excavations here and write learned treatises about the Great Wall of the United States. Perhaps one of them will be the descendant of a Mexican stealing north at this moment in the midnight hour. □



▲ **Border Control** Should the United States wall itself off from its Mexican neighbors? Share your thoughts in our forum at ngm.com/0705.

CIUDAD JUÁREZ, MEXICO

Freight rolls a few feet north of Mexico on a line repeatedly hit by train robbers unfazed by border fences. Here, the eastern-most man-made barrier on the international frontier ends abruptly near the Rio Grande.



Text and photographs by **Mark W. Moffett**


LONE HUNTRESS

The Bulldog Ant

Fearless and belligerent, the inch-long bulldog ant of Australia uses her sharp vision and venomous stinger to track and subdue formidable prey. In a month of observing red bulldogs (*Myrmecia gulosa*), entomologist Robert Taylor and I discovered that these solitary predators often lie in wait near a blossom to ambush honeybees, sometimes snatching them clean out of the air.







Bulldog ants can spot an intruder two yards away and give chase. It is best not to get caught. The mind-numbing pain from their stings can last for hours. I approached this nest cautiously, holding my camera in outstretched arms and keeping the rest of my body at a distance so the ants wouldn't notice me. No luck: They exploded from their nest and jumped up onto my lens. While I snapped pictures, Bob Taylor frantically flicked away the ants climbing over the camera and up my arms.





Unable to eat solid food, adult bulldog ants can do no more than lick juices from the insects they kill. The meat of the prey is fed to the colony's larvae. The workers' liquid staples include their own shell-less infertile eggs, which they commonly feed to the queen or to each other, but occasionally eat themselves. Above, a worker slings her black-tipped abdomen beneath her body and extrudes an egg. At right, she offers the liquid dollop to her queen.



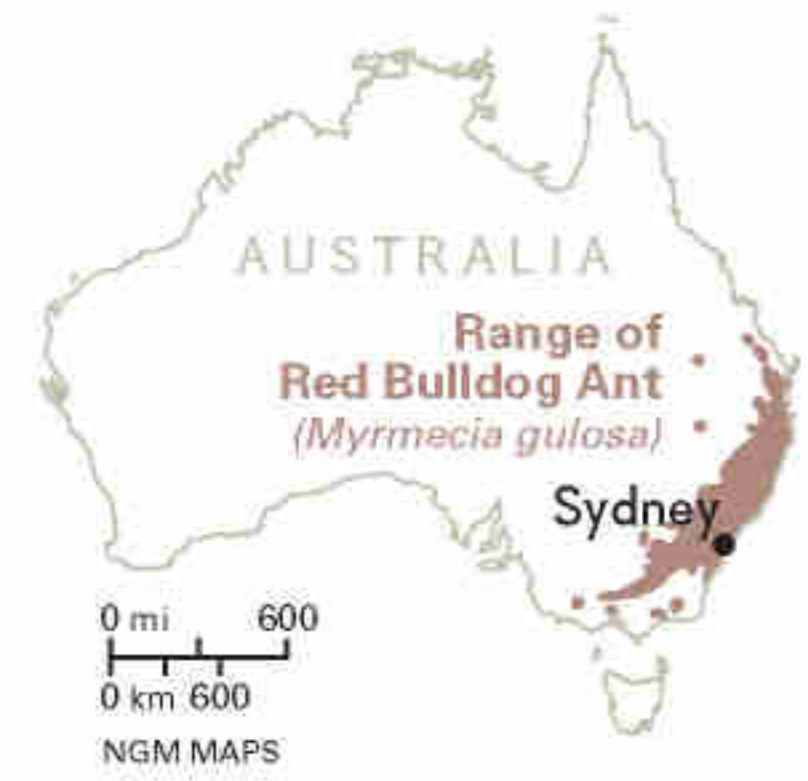
ABOVE: RED BULLDOG ANT, ACTUAL SIZE



PICTURE A WASP with its wings ripped off, and you'll have a good approximation of a bulldog ant. The resemblance is no coincidence: Ants are believed to have evolved from wasplike ancestors some 140 million years ago. The bulldog ant has long been considered one of the oldest ant lineages. But some recent studies suggest that bulldogs appeared no earlier than 100 million years ago, along with an explosion of other ant species that may have accompanied the rise of flowering plants. Nevertheless, they exemplify the anatomy and behavior experts believe the archetypal ancestor of all ants possessed: a big body with long legs, keen vision, venom-laced stingers, and relatively solitary habits.

While fossilized specimens reveal that bulldog ants were once widespread across the globe, today they are found only in Australia. Bulldog expert Bob Taylor brought me to a eucalyptus woodland near Nowra, a town south of Sydney, to track red bulldog ants, which nest there in sandy ground. We found them preying on bees and other ant species, especially carpenter ants. This is dangerous quarry, because more "advanced" ants such as carpenters can quickly recruit aid by sending chemical signals to their nestmates—an ability bulldogs lack. With her superior vision, however, a bulldog hunter can race around a carpenter ant, leap onto its back, and thrust in her stinger before her bewildered victim has a chance to marshal a counter-attack. Primitive, perhaps. But she gets the job done.

To capture images of bulldog life below ground, Taylor and I had to set up a life-size artificial nest and populate it with a colony taken from the wild, including its queen. We blew carbon dioxide into the nest entrance to put the ants to sleep, and started digging like mad, gathering ants as we went. Here and there stashes of larvae and pupae lay in flat-bottomed chambers, and we collected those too. But the queen in a bulldog colony dives to the farthest extremity of a nest at the slightest disturbance. By the time we finally bagged her two yards beneath the surface, the ants had awakened, and our bodies were quivering from repeated stings. After letting the colony settle in to the artificial nest for a couple of days, I spent the next few weeks observing the more tender side of this ferocious insect. —M.M.







Bulldogs act alone outside the nest, and even inside it keep their distance from each other more than most ant species do. But behavior within a colony is still guided by the indefatigable altruism that characterizes all ants. Adult workers lavish attention on their fat, legless younger siblings still in larval stage, segregating them by age and size, and feeding the insatiably hungry brood with insects and food eggs (below). When a larva is full-grown, workers gently cover it with sand grains (above), which the larva uses as a scaffolding to spin a silken case around itself. A few days later, workers unearth the cocoon with its pupa growing inside. When the newly formed adult struggles to break out several weeks later, a sister scissors through the cocoon with her long mandibles, serrated like pinking shears, and helps pull her free (left).





Adult ants do not grow at all, so an individual's size is determined entirely by how large it grew in its larval stage. While there are no clear-cut distinctions, larger bulldog adults typically leave the nest to hunt, while smaller ones normally stay behind and care for the young. □



🦋 **A Mean Sting** “It’s like having hypodermic needles stuck in your back,” says author Mark Moffett of the bulldog ants that attacked him. Read more about his ordeal in Field Notes at ngm.com/0705.



Gangu Kadam Devdas, at right, greets a neighbor and her baby at the door of her sewer-front Dharavi home. Devdas has been working, mainly in the recycling industry, since she was 11 years old.

DHARAVI, PAGE 68 For the Children Many kids start school in Dharavi; few of them finish. One of the community's greatest challenges is education. Though employment of children under age 14 in factories and at other hazardous work is illegal in India, child labor persists. Girls are frequently classified as helpers or domestic workers to get around the law. Children's labor and income can be crucial to a family's survival. Some factory owners convince parents that youth will gain skills and have better lives if they work away from home. But by the time the children finish their long commitments to these employers, they've fallen too far behind to resume school. Groups working to improve the lives of Dharavi's youth include:

■ **Pratham** Founded in the slums of Mumbai in 1994, this NGO reaches out to more than 30,000 children in Dharavi each year. Programs offered in Dharavi and other poor communities include health screening, preschools, computer classes, teacher training, and literacy outreach. Pratham workers also negotiate with factory owners to release children from employment obligations. prathamusa.org

■ **AVSAR** The Alliance of Volunteers for Service, Action, and Reform is a nonprofit umbrella group for grassroots organizations working with underprivileged communities in Mumbai and throughout India. Since 2003, AVSAR has coordinated donors and volunteers from around the world to work in schools, hospitals, clinics, and wherever else they are needed. avsarindia.org

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Diane Cook and Len Jenshel at the Mexico-U.S. border in Tijuana.

ON ASSIGNMENT **Sticks and Stones** Along the walls that separate Mexico from the U.S., sunset launches a constellation of activity—much of it illicit. While Diane Cook and Len Jenshel photographed the barrier in one Arizona town, smugglers on the other side threw rocks at them. A border guard recommended the photographers leave, but the husband-and-wife team refused. “We’d waited all day for the light,” says Cook. “One of us looked out for rocks while the other took photographs.”



Domesticated pigs transformed colonial Virginia, says writer Charles Mann (above). But this one from a Virginia farm just hogged the camera.

ON ASSIGNMENT
The Other Landing

Jamestown, Virginia, has long suffered second-city status as the poor relative of that other colonial settlement, Plymouth, Massachusetts, so competitive feelings sometimes surface. When writer Charles Mann, a Massachusetts resident, visited Jamestown, “A couple of people said, ‘You’re not from Plymouth, are you?’” In fact, some of his ancestors did arrive on the *Mayflower*. Mann, though, was raised in the Pacific Northwest and only later moved to Massachusetts.



Frans Lanting and his team set a camera trap in Zambia.

ON ASSIGNMENT

Tricks of the Trade

Setting camera traps “is like a game,” says photographer Frans Lanting, far left. “You have to outsmart the animals.” To mask their human scent on traps near a warthog burrow in Zambia’s Luangwa Valley, he and his assistant Reuben Mbao, right, and their guide, Gilbert Zulu, wrapped equipment in cloths they’d soaked in elephant dung and water. “The smell was very ripe,” says Lanting. And it worked. One of the resulting photos appears on pages 112-13.

May Contributors

AMERICA, FOUND & LOST page 32

Charles C. Mann’s latest book is *1491: New Revelations of the Americas Before Columbus*. He is a correspondent for *Atlantic Monthly* and *Science* and is working on a book about the worldwide cultural and environmental effects of the colonization of the Americas.

WHAT WOULD YOU TAKE TO THE NEW WORLD? page 56

Karen E. Lange is a senior writer for the magazine. Her children’s book, *1607: A New Look at Jamestown*, was published in February.

Robert Clark, who photographed the artifacts for this article, spent 50 days traveling across the U.S. taking pictures with a camera phone for his book *Image America*. His most recent story for the magazine was “Mending Broken Hearts.”

DHARAVI, page 68

Mark Jacobson is the author of *Teenage Hipster in the Modern World*, a collection of his magazine pieces from the past 30 years, and *12,000 Miles in the Nick of Time*, an account of a family trip around the globe. This is his first article for NATIONAL GEOGRAPHIC.

Jonas Bendiksen is a Norwegian photographer with Magnum. His Photo Journal about former Soviet republics appeared in the December 2006 issue.

LUANGWA VALLEY, page 94

Christine Eckstrom and **Frans Lanting** have dedicated much of the past two decades to documenting the natural world. Eckstrom is a writer and video producer who has contributed to more than a dozen National Geographic books. In 2001, Prince Bernhard of the Netherlands inducted Lanting, a Dutch national, as a Knight of the Order of the Golden Ark.

OUR WALL, page 116

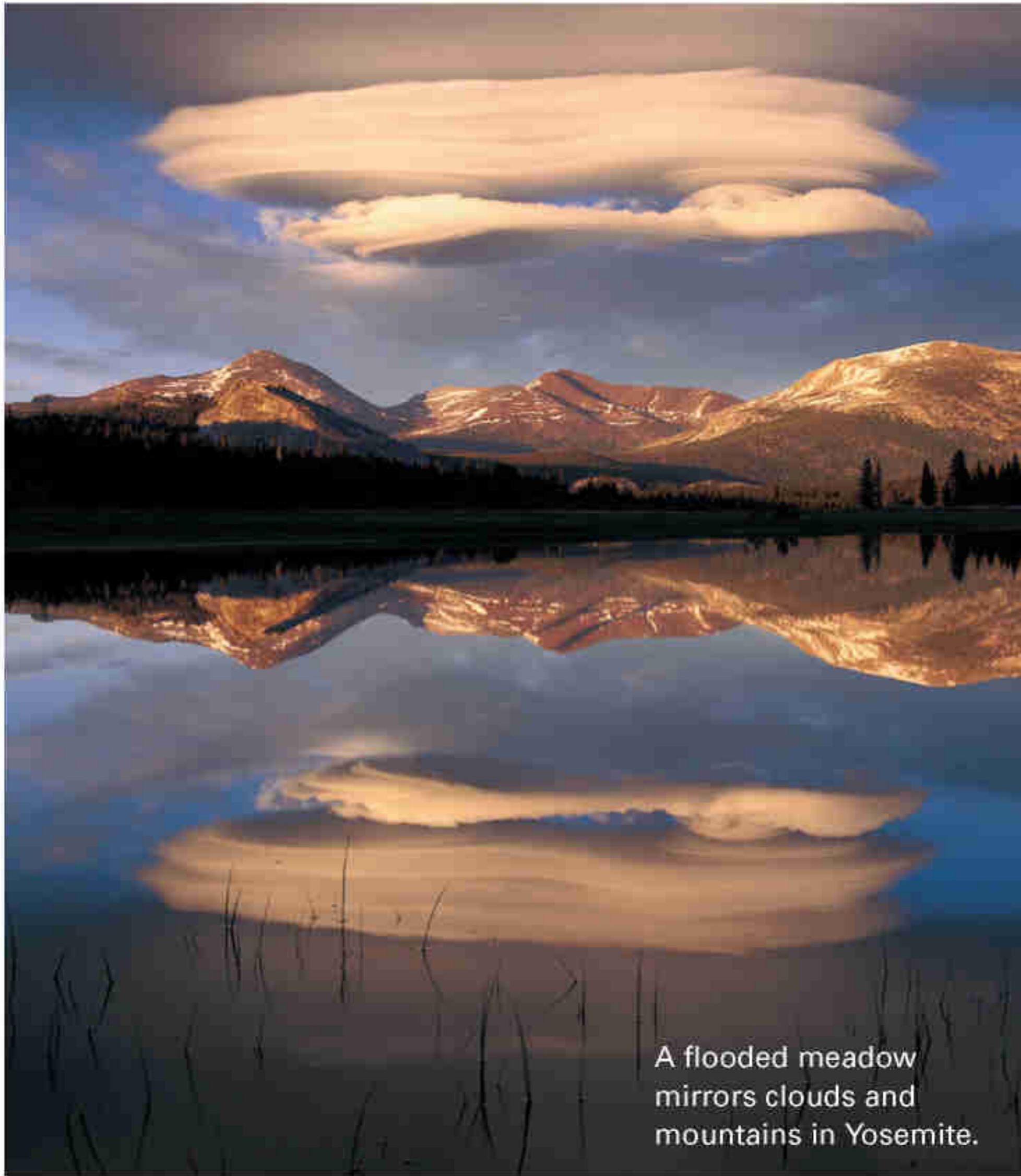
Charles Bowden has lived near the Mexico-U.S. border for most of his life. He is the author of *Down By the River: Drugs, Money, Murder, and Family* and *A Shadow in the City: Confessions of an Undercover Drug Warrior*.

Diane Cook and **Len Jenschel** specialize in photographing landscapes. They’re currently collaborating on projects that combine her black-and-white work with his color images, including *The Edge of New York*, a book about that city’s waterfront.

LONE HUNTRESS, page 140

Mark W. Moffett’s article about bulldog ants is part of an ongoing ant series for the magazine. His story on army ants ran in August 2006. Moffett is also at work on a book about ants for Harvard University Press.

➤ **Tales From the Field** Learn more about our contributors in Features at ngm.com/0705.



A flooded meadow mirrors clouds and mountains in Yosemite.



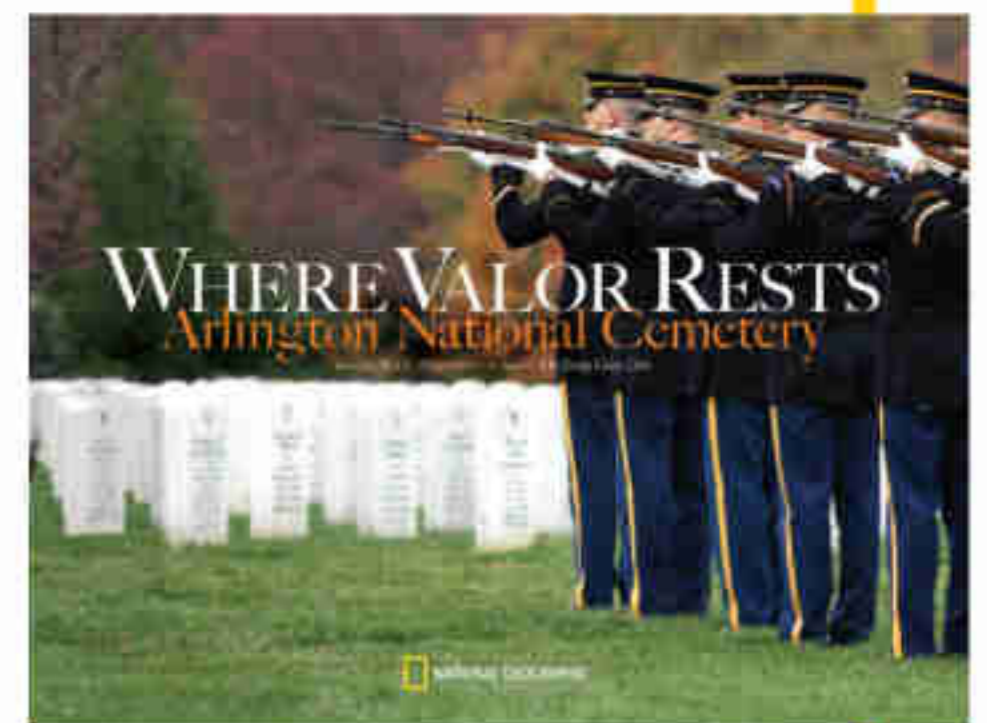
The Wild Side of U.S. Parks

Yellowstone and Yosemite: These famous national parks have received millions of visitors over the years. But off the trails lies wilderness few have explored. This month National Geographic Channel takes viewers to *Secret Yellowstone* and *Secret Yosemite* to see hidden waterfalls, giant sequoias, and rugged backcountry trails. Experience the untraveled corners of these majestic places.

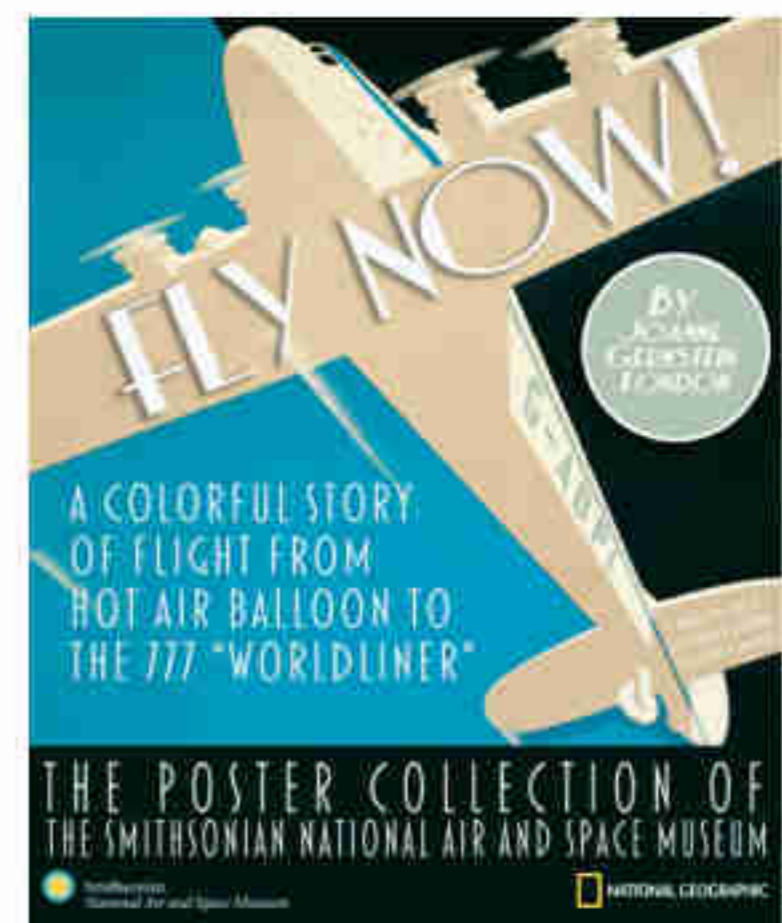
BEHIND THE SCENES D.C. BioBlitz Snaking through the heart of Washington, D.C., Rock Creek Park is one of the country's largest natural urban parks. For 24 hours starting at noon on May 18, hundreds of volunteers and scientists will find and identify as many as possible of the park's plant and animal species in a BioBlitz sponsored by National Geographic. Biologist E. O. Wilson will participate, as will conservationist Mike Fay. Families are encouraged to join in. "We want to inspire the next generation of scientists and conservationists," says NGS vice president John Francis. For more information, go to nationalgeographic.com/conservation/bioblitz.

NG Books

Where Valor Rests Arlington National Cemetery, along the Potomac River in Virginia, is the resting place for more than 300,000 service members, including soldiers from the Revolutionary War to the present, Presidents, and former slaves. Photo essays by David Burnett, Brian Lanker, and others honor the solemn beauty of this symbol of U.S. history (\$30).



Fly Now! Whether marketing a hot-air balloon show in late 19th-century Paris or a luxury transatlantic jet, aviation advertisements promise glamour and excitement, a chance for reinvention. A companion book to the Smithsonian National Air and Space Museum's "Fly Now!" exhibit, this collection of posters from 1827 to 2007 chronicles the continuing fascination with flight and provides a stunning time line of popular culture and graphic design (\$25).





JOEL SARTORE

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On the Fence Balancing on bicycles, Icelanders watch British soccer players practice. This photo was acquired by NATIONAL GEOGRAPHIC in 1943 and was probably taken in the early 1940s, when World War II engulfed most of Europe. Officially neutral, Iceland played a strategic role in the conflict, allowing British and U.S. forces to operate from bases on the island and secure Allied control of the North Atlantic. Soccer had come to Iceland only 50 years or so earlier and had found instant popularity. Today, the men's national team hasn't yet made it to a World Cup, but the women's team consistently ranks among the top 20 soccer clubs in the world. —*Siobhan Roth*

👉 **Flashback Archive** See all the photos plus e-greetings at ngm.com/0705.

PHOTO: WILLIAM MCGREAL, NATIONAL GEOGRAPHIC IMAGE COLLECTION

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